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27th Annual

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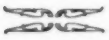
September 6, 7, 8, 9 and 10, 1949



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ORIGINAL ARTICLES

Some Metabolic Observations During and After Exercise in Patients Convalescing from Acute Illnesses. Robert C. Darling M.D. With the Technical Assistance of Ethel Shea, A.B. 71
Discussed by Drs. B. A. Strickland, Jr.; Nathaniel Glickman, and Darling.

Physical Medicine in Disabilities of the Aged. Harold Dinken, M.D. 78
Discussed by Dr. M. B. Ferderber.

A Physical Medicine Rehabilitation Hospital. Robert W. Boyle, M.D. 82

The Effects of Therapeutic Exercise on the Peripheral Circulation of Normal and Paraplegic Individuals. Khalil G. Wakim, M.D.; Earl C. Elkins, M.D.; Ralph E. Worden, M.D., and Howard F. Polley, M.D. 86
Discussed by Drs. H. Kraus, and Elkins.

Reliable Evidence for Acceptance of Devices for Physical Medicine. Howard A. Carter, M.E. 96

The Use of a Cold Room in Treatment of Hyperpyrexia and Burns. Herbert R. Brown, Jr., M.D., and Vincent De Lalla, Jr., M.D. 98

Therapeutic Devices Under the Federal Food, Drug and Cosmetic Act. Irvin Kerlan, M.D. 102
Discussed by Howard A. Carter.

Progress Report 106

•

Editorials 107

•

Medical News 111

•

Book Reviews 116

•

Physical Medicine Abstracts 120

•

EDITOR OF THE MONTH

EARL C. ELKINS, M.D.
Rochester, Minn.

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Postgraduate Course in Physical Medicine and Rehabilitation

UNIVERSITY OF TEXAS, MEDICAL BRANCH, GALVESTON

FEBRUARY 28 - MARCH 4, 1949

TENTATIVE PROGRAM

All meetings, unless otherwise stated, will be held in the Amphitheater, 4th floor, Outpatient Building.

Monday, February 28 —

8:00 Registration

Morning Session — Wilbur A. Selle, Chairman

9:00	Opening Remarks	Truman G. Blocker and Chauncey D. Leake
9:15	The Challenge of Physical Medicine Rehabilitation in the Veterans Administration and in General Practice	A. B. C. Knudson
9:45	What Do We Mean by Rehabilitation — Why Is It Important?	A. W. Reggio
10:15	Intermission	
10:25	Assistive and Supportive Apparatus in the Treatment of Muscle and Nerve Injuries	Robert L. Bennett
11:00	Aspects of the Backache Problem	James B. Mennell

Afternoon Session — Edward Randall, Chairman

1:30	Light Therapy	Richard Kovács
2:30	Physical Medicine in Army Hospitals	Lt. Col. Richard B. Dear, MC
3:00	Intermission	
3:15	The Development and Progress of Corrective Therapy and Its Application to General Practice	John E. Davis
3:45	Work of the Council on Physical Medicine	Frederic T. Jung
4:15	Joint Application of Occupational Therapy and Physical Therapy in Physical Medicine	Ben. L. Boynton

Evening — Hotel Galvez — Movies

Tuesday, March 1st —

Morning Session — Stafford L. Osborne, Chairman

8:15	Hydrotherapy	Hans J. Behrend
9:00	Use of Aquatics in the Physical Reconditioning Program	Edward F. Quinn
9:30	The Use of Physical Agents in the Treatment of Arthritis	Sedgewick Mead
10:00	Physical Medicine in Relation to Geriatrics	Donald Erickson
10:30	Intermission	
10:45	Manipulation of the Joints	James B. Mennell

Afternoon Session — G. W. N. Eggers, Chairman

1:30	Medical Diathermy	Stafford L. Osborne
2:30	Physical Medicine in Fractures	Miland E. Knapp
3:00	Intermission	
3:10	Physical Medicine in Second and Third Degree Burns	A. E. White
3:40	Rehabilitation of the Tuberculosis Patient	Vincent J. Sutch
4:10	Quack Devices and Fallacies	Frederic T. Jung
4:40	Accidental Injuries in Physical Medicine	Richard Kovács

Evening — Hotel Galvez — Entertainment

Wednesday, March 2nd —

Morning Session — Oscar O. Selke, Chairman

8:15	Physiologic Basis for Heat and Cold	W. A. Selle
9:00	Fundamentals of Massage	James B. Mennell
10:00	Cervico-brachial Pain	Robcliff B. Jones
10:30	Functional Anatomy of the Upper Extremities	Donald Duncan
11:00	Gravitational Edema	Truman G. Blocker
11:30	Physical Medicine in Vascular Diseases	Sedgwick Mead

Afternoon Session — Chauncey D. Leake, Chairman

1:30	Low Frequency Currents	Richard Kovács
2:15	Minor Electric Surgery	Richard Kovács
2:50	Intermission	
3:00	Electrical Stimulation of Muscles	Stafford L. Osborne
3:30	Physiologic Basis for Therapeutic Exercise	Oscar O. Selke
4:15	The Role of Physical Medicine in Chest Diseases and Surgery	Florence Linduff

Evening Meeting — Hotel Galvez

Thursday, March 3rd —

Morning Session — A. B. C. Knudson, Chairman

8:15	Clinical Demonstrations	The Staff, University of Texas
9:00	Principles of Muscle Testing and Muscle Reeducation	Robert L. Bennett
10:00	Rehabilitation of the Paraplegic	Donald Erickson
10:30	Intermission	
10:45	Rehabilitation of the Amputee	Henry H. Kessler
11:30	Some Aspects of Atomic Energy in Physical Medicine	John Z. Bowers

Afternoon Session — Arild Hansen, Chairman

Symposium on Poliomyelitis and Cerebral Palsy

1:30	Management of Bulbar Poliomyelitis	C. G. Grulee
2:00	Treatment of the Muscular After Effects of Poliomyelitis	Miland E. Knapp
2:30	Intermission	
2:45	The Ideal Treatment Program for Poliomyelitis	Robert L. Bennett
3:30	General Aspects of Cerebral Palsy	M. A. Perlstein

Thursday Evening — Galvez Hotel — Annual Dinner

D. Bailey Calvin, Presiding

Friday, March 4th —

Morning Session — Ben L. Boynton, Chairman

8:15	Postural Exercises	Oscar Selke and Staff
9:00	"Wet Clinic" on Radioactive Isotopes	The Staff
10:00	Instrumentation for Therapeutic Radiosotope Application	W. A. Selle
10:30	Intermission	
10:40	Summaries and Round Table Discussions	Guest Speakers

Afternoon Session — Jack Ewalt, Chairman

Symposium on Physical Medicine in Neuropsychiatry

1:30	The Place of Physical Medicine in Psychiatry	A. B. C. Knudson
2:00	Corrective Therapy, an Individualized Approach to the Mental Patient	John E. Davis
2:30	Rehabilitation of the Neurotic Patient	
	(Discussions by Martin E. Grobman, S. Charles Burlingame, Jack Ewalt)	
4:00	Closing Remarks—Chauncey D. Leake.	

Registration — In order to determine what attendance may be expected, those planning to participate are requested to register in advance with Dr. T. G. Blocker, Director of Postgraduate Study. A tuition fee of $25.00 for physicians and administrators and $15.00 for registered technicians will be charged. An additional $2.00 fee will be charged those desiring certification of attendance at the Course.

Hotel Reservations — Individuals will be expected to make their own room reservations with Hotel Galvez, headquarters.

For further information regarding the course, write: Dr. W. A. Selle, Director of Postgraduate Course in Physical Medicine, University of Texas, Medical Branch, Galveston.

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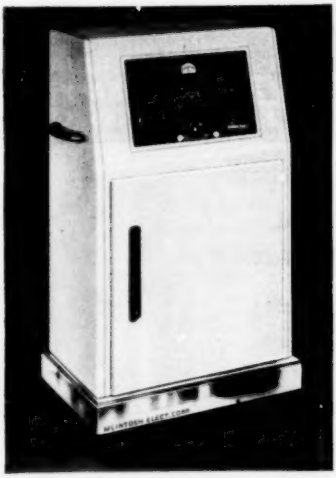

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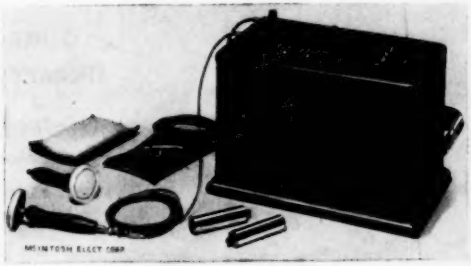

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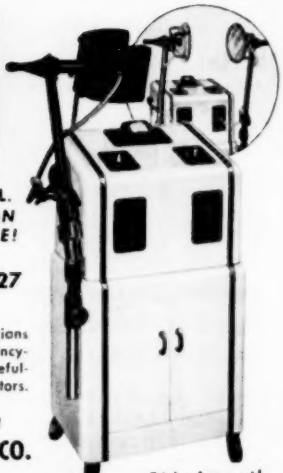

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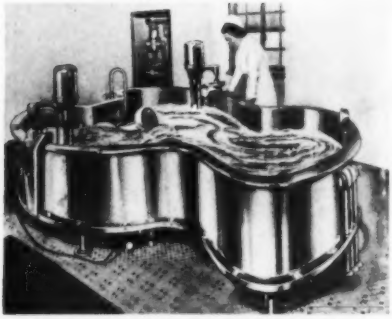

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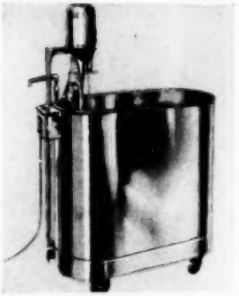

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SOME METABOLIC OBSERVATIONS DURING AND AFTER EXERCISE IN PATIENTS CONVALESCING FROM ACUTE ILLNESSES *

ROBERT C. DARLING, M.D.

With the Technical Assistance of Ethel Shea, A.B.

NEW YORK

The asthenia and lack of well-being during convalescence from medical and surgical illnesses are obvious and universal clinical observations. However, simple objective changes to explain or parallel this asthenia have been elusive. Among a large number of chemical and physiologic estimations taken at rest, only the blood volume,[1] and venous pressure[1a] have been shown to be slightly decreased over their control value in the same person. The relationship between weight loss and the observed fall in blood volume is not wholly clarified. Studies of normal young men after three or six weeks of enforced bed rest[2] indicate changes in exercise response similar to those seen in loss of athletic training — i. e., increase in pulse rate during moderately severe exercise, diminished exercise capacity, lowering of maximum oxygen transport and various manifestations of loss of coordination and vasomotor adjustment. However, even the moderate exercise used in these studies is too severe to be used with any but an exceptional convalescent patient and perhaps for this reason reports on convalescence from illness have failed to show such consistent changes as in the normal subjects. Mann[3] reported the pulse rate as an unreliable index and preferred secondary rises in blood pressure as an index of cardiovascular strain. Starr and colleagues[4] found regular circulatory changes only after prolonged and complicated illnesses.

At least two important factors, not necessarily inherent in illness itself, play an important part in any study of convalescents. In the first place, the complex psychologic disturbances almost universally occurring in sick persons make quite unreliable as indications of physiologic disturbance the measurements dependent upon voluntary effort, such as the capacity for heavy work. A second factor, associated to a variable degree with illness, which has been quite properly emphasized recently,[5] is nutritional deficiency, particularly of proteins. Reports of circulatory disturbances following long and complicated illnesses,[4a] especially when abdominal surgery is involved, are probably chiefly concerned with the effects of semistarvation. However,

* From the Department of Medicine, College of Physicians and Surgeons, Columbia University, and the Presbyterian Hospital in the City of New York.

* Read at the Twenty-Sixth Annual Session of the American Congress of Physical Medicine, Washington, D. C., Sept. 11, 1948.

* This research was aided by a grant to Columbia University from the Baruch Committee on Physical Medicine.

1. (*a*) Meneely, G. R.; Segaloff, A., and Wells, E. B.: Circulatory Dynamics in the Basal State Observed During Convalescence: Changes in Body Weight, Blood Volume and Venous Pressure, J. Clin. Investigation **26**:320 (March) 1947. (*b*) Rutstein, D. D.; Thomson, K. J.; Talmach, D. M.; Walker, W. H., and Floody, R. J.: Plasma Volume and "Extravascular Thyocyanate Space" in Pneumococcus Pneumonia, ibid. **25**:11 (Jan.) 1945. (*c*) Taylor, H. L.; Erickson, L.; Henschel, A., and Keys, A.: Effect of Bed Rest on Blood Volume of Normal Young Men, Am. J. Physiol. **144**:227 (July) 1945.

2. (*a*) Dietrick, J. E.; Whedon, G. D., and Shorr, E.: Effects of Immobilization Upon Various Metabolic and Physiologic Functions of Normal Man, Am. J. Med. **4**:3 (Jan.) 1948. (*b*) Taylor, H. L.; Henschel, A.; Erickson, L., and Keyes, A.: The Circulatory Changes in Man Induced by Bed Rest and Alteration in Activity, Federation Proc. **4**:71 (March) 1945.

3. Mann, H.: Circulatory Reactions to Exercise During Convalescence from Infectious Diseases, Arch. Int. Med. **21**:682 (May) 1918.

4. Maycock, R. L.; Koop, C. E.; Riegel, C.; Kough, N. T., and Starr, I.: Convalescence from Surgical Procedures: III. The Relation of Nitrogen Balance and Blood Volume to Abnormalities of the Circulation, Am. J. Med. Sci. **212**:591 (Nov.) 1946. Starr, I.; Maycock, R. L., and Battles, M. G.: Convalescence from Surgical Procedures: II. Studies of Various Physiological Responses to a Mild Exercise Test, ibid. **210**:713 (Dec.) 1945.

5. Peters, J. P.: Symposium on Physiological Aspects of Convalescence and Rehabilitation: Problems of Nitrogen Metabolism, Federation Proc. **3**:197 (Sept.) 1944.

asthenia is regularly observed after short uncomplicated illnesses during which the nutritional factor could not reasonably play a major part.

It is from such a group that the material of this paper was drawn. Subjects were chosen who were recovering from medical illnesses leaving no recognizable organic defect and uncomplicated by marked weight loss or inability to take food. In order to avoid individual variations each subject was his own control — i. e., a small battery of observations was made during a simple standardized exercise once during early convalescence and again after full recovery of well-being.

Method

The material reported here was obtained on 8 subjects, each of whom was tested first during the first two days of ambulation after the illness and again two to eight weeks later, after full convalescence. These 8 subjects were a portion of a larger number of subjects, the rest of whom could not be summoned back for the postconvalescence test. Of the 8 subjects 5 were male and 3 female, aged from 14 to 45 (average 27). The diagnoses were: pneumonia, 3; rheumatic fever (adult type) without evidence of carditis, 3; infectious hepatitis, 1, and rickettsialpox, 1.

The test procedure was carried out one to two hours after breakfast. The subject rested in a chair for twenty to thirty minutes; then his expired air was collected for ten minutes in a Douglas bag through the customary mouthpiece and flutter valves, capillary blood was collected from a finger prick for lactate and sugar and the pulse rate was counted every five minutes. Exercise consisted in walking for five minutes around the level laboratory floor, at 60 steps per minute (2 miles an hour). During this time the patient's expired air was collected in another Douglas bag suspended on a light packboard carried on his back. The customary mouthpiece and nose clip were held in place by a cutaway army gas mask with its head straps. Pulse rate was counted during the last minute of the exercise. Immediately at the end of exercise the packboard was taken off, the subject seated and a new collection of expired air begun. Observations were continued for twenty minutes of rest after the exercise. Expired air was collected in two portions: 0 to 8 minutes in one sample, and 8 to 20 minutes in another; pulse rate was counted at 2, 5, 10, 15 and 20 minutes. Finger prick blood was taken for lactate and sugar immediately and 12 minutes after exercise. In a few cases additional samples at 5 and 20 minutes failed to add significant data.

Expired air volumes were measured on a calibrated dry gas meter; samples were analyzed for carbon dioxide and oxygen on a Haldane apparatus. Blood was analyzed for lactate in duplicate by Edwards' modification[6] of the method of Friedman, Cotonio and Schaffer. Sugars were analyzed by the micromethod of Folin as modified for the photoelectric colorimeter by Horvath and Knehr.[7]

Results

The exercise and test procedures could be carried out by all the subjects. However, they were definitely strenuous for them when just out of bed from an illness and much easier after convalescence. The data obtained are conveniently reported under five categories.

1. *Oxygen Consumption.* — The oxygen consumption in all periods measured was remarkably unaffected by convalescence, as shown by the average figures in table 1. Even among the individual subjects the differences between the convalescent and control periods were small in all instances. The unchanged oxygen consumption in exercise means, of course, an unchanged efficiency of performing the exercise. This is wholly in line with the findings on severe exercise during training and during the recovery from a period of bed rest without illness.[2b] Contrary to the common impression, the efficiency with which one performs an unskilled task is apparently constant under a variety of conditions. The unchanged oxygen consumption during recovery means that the small oxygen debt involved in this mild work is not

6. Edwards, H. T.: A Simplified Estimation of Lactate in Normal Human Blood, J. Biol. Chem. 125:571 (Oct.) 1938.
7. Horvath, S. M., and Knehr, C. A.: Adaption of the Folin-Macros Micro Blood Sugar Method to the Photoelectric Colorimeter, J. Biol. Chem. 140:869 (Sept.) 1941.

grossly affected by the convalescent state. As will be apparent later from the low lactate value, the oxygen debt here is not that related to removal of accumulated lactate.[8]

2. *Blood Sugar.* — In this category also there is no apparent change in blood sugar level in early convalescence (table 2). It is well known that depletion of blood sugar occurs in normal persons only after severe prolonged exercise;[9] hence this test might be expected to detect only severe depletion of glycogen stores or derangement of sugar mtabolism.

TABLE 1. — *Averages of Measurements of Oxygen Consumption on 8 Patients.*

	During Convalescence (Liters/Min.)	After Convalescence (Liters/Min.)
At rest	0.248	0.251
Exercise	0.510	0.506
Recovery 0 — 8 min.	0.267	0.268
Recovery 8 — 20 min.	0.235	0.239

TABLE 2. — *Measurements of Blood Sugar in 8 Patients (Mg. Per 100 Cc.)*

	Mean During Convalescence	Mean After Convalescence
At rest	121	121
Exercise	121	123
Recovery 12 min.	116	109

3. *Pulmonary Ventilation.* — There is some corroboration in our data for the frequent observation of breathlessness after a period of confinement to bed. In table 3 are listed the results with a partial statistical analysis; the figures are given as pulmonary ventilation per liter of oxygen consump-

TABLE 3. — *Measurements of Pulmonary Ventilation on 8 Patients (Liters of Ventilation Per Liter of Oxygen Consumption).*

	Mean During Convalescence	Mean After Convalescence	Difference of Means	Standard Error of Difference of Means
At rest	34.4	28.5	+5.9	2.4
Exercise	24.7	24.2	+0.5	1.3
Recovery 0 — 8 min.	33.0	28.0	+5.0	1.3
Recovery 8 — 20 min.	32.0	29.1	+2.9	1.7

tion in order partly to eliminate the factor of body size. The units given are those commonly used as indices of ventilatory efficiency. The increased ventilation in early convalescense is most apparent in early recovery from exercise and not at all present during the exercise itself. Too much weight cannot be placed on these figures because (1) the differences are small and not of a high order of statistical significance and (2) it is possible to explain them on the basis of greater apprehension and excitement incident to the tests during convalescence. However, in the presence of unchanged oxygen consumption (table 1) and only small irregular changes in respiratory quotient (not on tables), the possibility remains that there is a minor defect in the breathing mechanism, perhaps poorer coordination of the respiratory muscles.

8. Margaria, R.; Edwards, H. T., and Dill, D. B.: The Possible Mechanisms of Contracting and Paying the Oxygen Debt and the Role of Lactic Acid in Muscular Contraction, Am. J. Physiol. **106**:689 (Dec.) 1933.

9. Dill, D. B.; Edwards, H. T., and Mead, S.: Blood Sugar Regulation in Exercise, Am. J. Physiol. **111**:21 (Feb.) 1935.

4. *Pulse Rate.* — Pulse rate during and after exercise has been widely used as an index of physical fitness.[10] Under the conditions of these studies, however, it was not a very reliable differential between the convalescent and the postconvalescent state. True, the mean values were higher in convalescence during all periods measured (table 4) and were higher in a majority of the individual subjects, but a few individuals had lower pulse rates in

TABLE 4.— *Measurements of Pulse Rate in 8 Patients.*

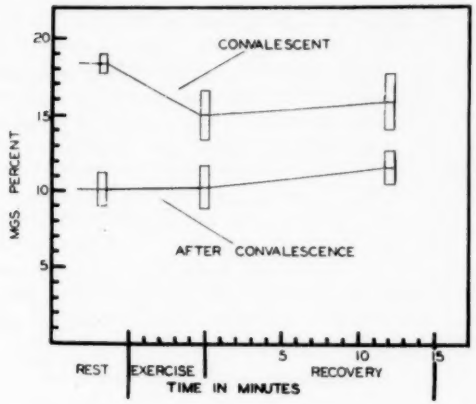
	Mean During Convalescence	Mean After Convalescence	Difference of Means	Standard Error of Difference of Means
At rest	88	82	+6	3.7
Exercise	109	93	+16	4.3
Recovery 2 min.	89	76	+13	5.7
Recovery 5 min.	91	79	+12	5.1
Recovery 10 min.	90	79	+11	4.4
Recovery 15 min.	90	80	+10	3.9
Recovery 20 min.	91	79	+12	4.9

convalescence and the mean figures are surely significantly different only during the exercise. Undoubtedly, differences in pulse rate would have been greater if the exercise had been more strenuous. Possibly vagal reflexes played a role in those persons with lower pulse rate, as occasionally occurs in exhausted normal persons and as was noted also by Mann[3] in some convalescents.

5. *Blood Lactate.* — The changes in this category were the most uniform and interesting found in this study. The normal value for blood lactate by the method used is up to about 20 mg. per hundred cubic centimeters, and the individual variations are large. Therefore, it is fortunate — and essential — that individual control values (after convalescence) were available. The chart presents a summary of the results obtained. It will be noted that, although mean values (and individual values as well) were within accepted normal limits, (1) the resting lactate was definitely higher in convalescence, (2) it fell during exercise and remained at a lower level and (3) the lactate in the control tests remained constant at the lower level. Complete explanations of these changes are lacking, but possibilities may be indicated. It is difficult to explain changes on the basis of circulation and oxygen supply to the muscles, since these were adequate in all subjects at rest and during mild exercise. A better possibility is that mild exercise speeds up the chemical processes for reconversion and burning of lactate more than it increases the total metabolism, thus facilitating removal of a small accumulation of lactate. A similar phenomenon has been observed after strenuous exercise, when removal of large accumulations of lactate is speeded up by continuation of a milder grade of exercise.[11] If our tentative explanation is true, then the higher resting blood lactate in convalescence must be the result of a slowing up of at least some of the chemical processes concerned with sugar metabolism.

10. Darling, R. C.: The Significance of Physical Fitness, Arch. Phys. Med. **28**:140 (March) 1947. Johnson, R. E.; Brouha, L., and Darling, R. C.: A Test of Physical Fitness for Strenuous Exertion, Rev. canad. de biol. **1**:491 (June) 1942. Landis, E. M.: Symposium on the Physiological Aspects of Convalescence and Rehabilitation: Circulatory Adjustments: The Peripheral Circulation, Federation Proc. **3**:228 (Sept.) 1944.

11. Newman, E. V.; Dill, D. B.; Edwards, H. T., and Webster, F. A.: The Rate of Lactic Acid Removal in Exercise, Am. J. Physiol. **118**:457 (March) 1937.



Blood lactates before, during and after exercise: mean values ± standard error.

Comment

Under most clinical conditions, undernutrition and the complex psychic effect of illness probably play the dominant role in determining the actions of the person recovering from illness without residual defect. After illnesses with residual weakness, pain or disability, the situation is even more complicated. Its study and solution may be said to embrace an entire clinical science: convalescent medicine.

However, in the hope of understanding the various factors entering into disability following illness, it is necessary to study the simplest possible conditions. We have chosen to study the effect on normal men and women of a relatively brief acute illness with its enforced immobility. Obviously we could not obtain control studies before the onset, since the illness did not forewarn of its arrival. It is not yet established whether the voluntarily enforced bed rest in normal persons has the same effect as that due to an acute illness. Practical experience suggests that certainly the malaise and asthenia are greater after illness of similar duration. Studies of nitrogen and mineral loss confirm at least a quantitative difference.

Our control studies, chosen by necessity after convalescence, were probably adequate. It is possible that full convalescence had not fully occurred at the time they were taken, although by clinical criteria the patients were fully recovered and had gone back to full activity. In any event, our comparisons are valid, at least of early and late convalescence. The necessity of some form of individual controls has already been emphasized, especially when one is dealing with widely varying persons in a hospital population and when the measurements one is making show considerable variation from subject to subject.

The use of a form of stress such as exercise would seem to be essential if one is to pick up latent disabilities in any situation, especially in the study of convalescence, in which the defect is practically by definition a decreased capacity under stress. Our form of exercise (level walking) had the advantage of requiring no skill or training; ideally it might well have been more strenuous but would have been done with difficulty by our subjects.

Our hopes of discovering a simple objective index which would parallel the asthenia and malaise of convalescence have not been fulfilled. It is

probably naive to expect a very simple explanation of this phenomenon. It is hoped that our results will furnish a few signposts for fruitful future work. Certainly the metabolism at rest and during exercise and the recovery curve of metabolism do not look promising as indices unless the exercise is made much more strenuous. The results on pulmonary ventilation, although suggesting that convalescence lowers ventilatory efficiency, cannot be pursued further unless one is very careful to control emotional factors. The pulse rate will probably continue to be the chief index of convalescence because of its easy measurement, but our results indicate that it is not always reliable, at least after mild exercise. The lactate results, while not of sufficient magnitude to furnish an index, were uniform enough to suggest that the level of local chemical metabolic processes is one of the changes in convalescence; or possibly the factor involved is the circulation of the chemical metabolic organs such as the liver.

Summary and Conclusions

1. The need for objective measurements paralleling the asthenia and lack of well-being following illness is pointed out. Previous measurements of chemical and physiologic changes at rest have been largely uninformative. Observations following the semistarvation of prolonged and complicated illness were not considered pertinent to a study of the effect of the illness alone. The psychologic factors in convalescence are often so dominant that tests depending heavily on voluntary effort are difficult to interpret.

2. Patients were chosen who had self-limited medical illnesses. Each patient was subjected to a series of measurements at rest, while performing a simple standardized exercise for five minutes (level walking) and during the twenty minutes recovery from the exercise. This procedure was carried out on the first or second day out of bed and again two to eight weeks later, after full convalescence. The latter tests served as individual controls. Complete data were collected on 8 subjects. Measurements included metabolism by the collection and analysis of expired air, pulse rate, blood lactate and blood sugar.

3. The oxygen consumption at rest and during the exercise and oxygen consumption during recovery (or oxygen debt) were all unaffected by the convalescent state.

4. Likewise the blood sugar values were not affected.

5. The pulmonary ventilation at rest and in recovery from exercise was higher (10 to 15 per cent) in convalescence than in control measurements, but ventilation during exercise was unchanged. It is possible to attribute these changes to apprehension and excitement on the part of the subjects, although the lack of regular change in respiratory quotient and the constant oxygen consumption raise the possibility that there was slight impairment of pulmonary function.

6. Increase in pulse rate at rest and after exercise in the convalescent subject was less striking and less regularly observed than might have been expected from previous work on physical fitness. The mean pulse rate was 6 beats per minute faster at rest, 16 beats faster in exercise, and 10 to 13 beats faster in recovery than it was later after full convalescence. However, 3 of the 8 subjects showed slight changes in the opposite direction; hence the statistical tests of these differences shows a high degree of significance only during exercise.

7. Changes in blood lactate were the most striking and interesting observed. The lactate at rest of the recently ill subject was significantly

higher than some weeks later (18 vs. 10 mg. per hundred cubic centimeters); it tended to fall slightly during exercise (15 mg. per hundred cubic centimeters) where it persisted, whereas on control observations it remained constant during and after exercise. Although all these measurements were within the accepted normal range, the differences were clear-cut and may point to a fundamental chemical slowing associated with illness and inactivity.

8. Our hopes of finding a simple index paralleling the asthenia of convalescence have not been fulfilled. Perhaps the few deviations observed may be useful in searching further.

Discussion

Lieut. Col. Benjamin A. Strickland, Jr. (Medical Corps, United States Army): Dr. Darling's paper has been most interesting to those of us who are engaged in improving convalescent care. As he has pointed out, it is regrettable that there has not been found a simple index which would parallel the asthenia of convalescence. It seems likely that the asthenia of the convalescent patient is the result of poorly understood physiologic alterations of a general nature, to which numerous biochemical abnormalities observed, bear witness. By understanding these physiologic dysfunctions, we shall eventually be able to differentiate between the metabolic abnormalities which are due to the acute illness per se and those which are due to prolonged bed rest.

The clinically effective convalescent programs developed on more or less of an empirical basis by the armed forces medical services during the war have, as Deitrick points out, "led to the initiation of studies designed to clarify the physiological and metabolic derangements associated with infectious states as well as the manner in which they are influenced by bed rest."

The physical medicine service in Army general hospitals now carries out a convalescent program for patients recovering from acute illnesses, which has the following objectives: (1) to prevent, through a system of graduated bed exercises, as much of the deconditioning of the patient as possible; (2) to recondition the patient through graduated exercise so that when he is able to start activity he will have been progressively prepared for it and not told to get up and walk after a period of complete inactivity; (3) to accelerate the active dynamic regimen of objective exercise therapy as soon as the patient becomes ambulant. The patient participates in graduated individual and group exercises until he is meeting the activity demands of his job specification. Thus, when the patient is discharged from the hospital, he is ready to return to full duty.

As a result of this program we find: (a) Reduced readmission rates due to recurrences and complications and (b) An actual decrease in the time period of convalescence.

Of considerable value in Dr. Darling's study is the fact that there were found to be no appreciable differences in many of the metabolic factors in early convalescence and in late convalescence. This must not be construed to indicate that a dynamic convalescent regimen of exercise therapy is of no value. The efforts of investigators should be redoubled and aimed toward the discovery of some type of index of physical fitness applicable to the study of the deconditioning which occurs following acute medical illnesses.

A medically prescribed and graduated program of physical activity for the convalescent patient has been proved to be of great value in achieving a decrease in the time required for convalescence and in reducing the incidence of recurrence and complications.

Dr. Nathaniel Glickman (Chicago): I should like to commend Dr. Darling for the fine piece of work he has done. As I looked at his slides, it seemed to me that the oxygen consumption of the patients during exercise was up only about 100 per cent, and the exercise he gave the patients was, in my opinion, too mild really to bring out the changes in lactic acid which could be brought out in the patients during the convalescent period. I believe Dr. Darling has indicated that probably a greater amount of exercise would be in line with bringing out the effect of loss of fitness here. I just want to stress that point.

Dr. Darling (closing): I have very little to add. I appreciate Colonel Strickland's comments.

I did not mean to indicate that there was no clinical change in the subjects during the convalescent stage. Even the extremely mild exercise was all that the subjects immediately out of bed could carry on.

I should like to have had the exercise severer, and, if the relationship to the illness had been chosen differently, perhaps it could have been done. I am sure that the pulse rate would be a more reliable index and the lactate would undoubtedly show different changes if the exercise had been severer. However, it is perhaps fortunate that it was as mild as it was, because, otherwise, I do not believe that we would have been able to show this remarkable drop in lactate during the exercise.

PHYSICAL MEDICINE IN DISABILITIES OF THE AGED *

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The clinical problems related to our aging population have received increasing and widespread attention by the medical profession in recent years. In his Presidential Address before the Annual Session of the American Medical Association this year, Dr. R. L. Sensenich[1] stated that "medical progress is constantly extending the life expectancy of human beings. According to recent statistical studies, in 1900 there were about 3,000,000 persons in the United States aged 65 or over. In 1940, there were 9,000,000 aged 65 or over. Estimates suggest that there will be 14,000,000 aged 65 or over by 1960 and 21,500,000 in the age group by the year 2000."

It is estimated[2] that in 1943 there were 25,000,000 persons with chronic ailments, with an annual disability rate of one billion man days, and approximately one million deaths a year from the same causes. The National Health Survey of 1935-1936[3] shed much light on this problem. It revealed the lack of correlation between mortality, prevalence and disability. The estimated prevalence of certain chronic diseases was reported in the following order: arthropathies 6,850,000 cases and heart disease 3,700,000. The order of importance in causing disability was as follows: mental and nervous diseases, cardiovascular-renal disease, the arthropathies, tuberculuosis. The primary cause of mortality was cardiovascular disease.

This brief statistical review emphasizes the importance and magnitude of the problem of our aging population. This problem relates not only to the practice of medicine but also to important social, economic and educational aspects of our national life.

As physiatrists, we are all concerned with the physical treatment and restoration of large numbers of patients presenting the disabilities of later life. In the physical therapy section of the department of physical medicine of the Colorado General Hospital, one of the hospitals of the University of Colorado Medical Center, 1,097 patients were treated between January, 1947 and June, 1948. Of these, 452, or 41 per cent were in the age group between 40 and 50; 282, or 26 per cent, were between 50 and 60, and 119, or 11 per cent, were over 60. There is no statistical information on a national basis available for comparison, but I feel quite certain that it would be comparable, indicating that roughly one-third of the activities of departments of physical medicine are concerned with the care of patients over 50 years of age who exhibit the disabilities of later life.

In this group of patients, the following broad clinical classifications were noted in order of frequency: the arthropathies; trauma of bone, joint and muscle; vascular lesions (including hemiplegia), and neuromuscular disorders. In discussing treatment of this wide variety of disablities of the aged, basic concepts are important and must constantly be kept in mind.

* Read at the Twenty-Sixth Annual Session of the American Congress of Physical Medicine, Washington, D. C., Sept. 8, 1948.

1. Sensenich, R. L.: American Medicine and the Spirit of Its Progress, J. A. M. A. **137**:667 (June 19) 1948.

2. Klumpp, T. G.: Problems of an Aging Population, Am. J. Pub. Health **37**:156 (Feb.) 1947.

3. National Health Survey, 1935-36: Sickness and Medical Care Series, Bulletin No. 6, National Institute of Health, Washington, D. C., United States Government Printing Office.

Much of the aging process is incompletely understood, particularly from the viewpoint of biochemistry and physiology. A factor in the difficulty in evaluating aging is the close relationship between natural or genetic aspects of the process and those produced by external factors such as accident and disease. The progressive changes[4] not as yet shown to be due to specific diseases may be listed as follows: (1) gradual tissue desiccation; (2) gradual retardation of cell division, capacity of cell growth and tissue repair; (3) gradual retardation in the rate of tissue oxidation (lowering of the basal metabolic rate); (4) cellular atrophy, degeneration, increased cell pigmentation and fatty infiltration; (5) gradual decrease in tissue elasticity and degenerative changes in the elastic connective tissue; (6) decreased speed, strength and endurance of skeletal neuromuscular reactions; (7) decreased strength of skeletal muscles, and (8) progressive degeneration and atrophy of the central nervous system, impaired vision, hearing, attention, memory and mental endurance. These general changes have profound effect on all systems of the body including the digestive, circulatory, skin, endocrine, nervous, etc.

The physiatrist cannot overlook the importance of these changes. They affect the clinical use of all physical agents. More specifically, the problem of delayed tissue repair, development of trophic skin changes, intolerance to heat, cold and ultraviolet radiation, the tendency to develop contractures, deconditioning and muscle atrophy and many other phenomena encountered daily in the care of the aged patient are directly related to these basic physiologic changes. Failure to evaluate them adequately in prescribing physical treatment may not only lead to unsuccessful treatment but may actually lead to untoward or even disastrous results.

Physical Management of Disabilities

I should like, briefly, to discuss some aspects of the physical management of the four most frequent disability groups, previously mentioned.

1. *The Arthropathies.* — The hypertrophic or degenerative variety is most commonly encountered. As in younger groups, the aims of physical treatment are to relieve pain, increase range of joint motion and improve motor function. Heat must be used with caution in the presence of tissue changes previously noted. The mildest form of heat therapeutically effective and tolerated should be used. From the standpoint of individual treatment, there is not much special preference to be shown toward either moist or dry heat. Paraffin, luminous or infra-red rays the warm tub bath or hot packs may be effective. Heat, as a rule, should be followed by light effleurage and therapeutic exercise (either passive, active assistive, active or resistive) as indicated.

It is important that the physiatrist discuss in detail the nature of the disability with the patient and his family. The favorable prognosis with regard to life span must be stressed and the patient encouraged to "live with his disability." In every instance, in which it can be done, a program of home treatment should be initiated. The chronic nature of the disease makes it important that the patient assume, at least in part, responsibility for his comfort. If the treatment program is effective, it should be done more frequently than can usually be arranged in a busy department. The cost and inconvenience of departmental treatment schedules are also important in this regard.

2. *Trauma of Bone, Joint and Muscle.* — Physical treatment of these dis-

4. Carlson, A. J.; in Stieglitz, E. J.: Geriatric Medicine, Philadelphia, W. B. Saunders Company, 1944, chap. 3, 51-71.

abilities should attempt to promote peripheral circulation, prevent or correct edema and contracture and conserve or improve motor strength and function. The problems are no different from those occurring in the younger age groups, except insofar as they concern the degenerative changes previously stressed. Physical agents must be used with caution in the presence of these changes. The importance of preventing deconditioning resulting from prolonged immobilization in this age group must be stressed. Early mobility and ambulation are to be encouraged.

3. *Vascular Lesions.* — The problems of the hemiplegic patient have been discussed in a previous paper[5] and will not be dealt with here except to reiterate the importance of early motivation, use of pulley exercise, movement reeducation and gait retraining, with special attention to the functional demands of everyday activities.

A few words with regard to the problem of heating in the presence of seriously impaired peripheral circulation. If it is not possible to use heat directly over the involved extremity, distant heating may produce excellent results. For example, the application of heat to the pelvic area, with suitable insulation of the lower extremity, may result in good reflex blood flow to that extremity.

4. *Neuromuscular Disorders.* — The use of adapted arts and crafts of occupational therapy are invaluable in developing motor coordination, endurance and strength. Occupational therapy has a wide range of usefulness in the management of mental disease processes in the aged, well known to this group.

Comment

I have dealt only in very general terms with a few aspects of the clinical problem. It would be impossible in this brief paper to cover adequately the specific, individual problems of physical treatment encountered.

The vocational rehabilitation of the aged patient with a physical disability presents a difficult problem, beyond the scope or intent of this paper. Certainly, it is a problem with which industry will be more and more concerned as time passes. From a moral viewpoint, it would seem obvious that if we wish to prolong the normal span of life, we must assume the obligations such medical care imposes. We must make longer life attractive to the individual, in terms of economic independence and security.

Summary

1. Our aging population presents an important problem to practitioners in general and to the physiatrist in particular.

2. The physiologic aspects of aging have been presented and briefly discussed.

3. The physiologic changes associated with aging must be evaluated carefully by the physiatrist in prescribing physical treatment.

4. Some general observations with regard to the management of the arthropathies, trauma to bone, joint and muscle, vascular lesions and neuromuscular disorders in the aged are presented.

5. Dinken, H.: The Evaluation of Disability and Treatment in Hemiplegia, Arch. Phys. Med. **28**: 263 (May) 1947.

Discussion

Dr. Murray B. Ferderber (Pittsburgh): While it is evident that our aging population is increasing because of medical discoveries, it is also a fact that very little has been done to make the lot of these patients easier. Although the estimate of

the National Health Survey of 1935-1936 states there are approximately 25,000,000 persons with chronic ailments in this country, I believe that this figure is low.

It is only necessary to visit the almshouses, poorhouses and so-called institutions for the aged to see that there is no incentive for living or for continuing in the same pattern. It seems inconceivable to me that in an enlightened democracy these aging and chronic patients are shunted into institutions, many of which provide very poor domiciliary care. The changes which Dr. Dinken has so carefully elaborated are present. The physical care of these people must be less vigorous than for the younger members of society because of the degenerative changes and other factors, emotional and economic. Sometimes it seems unfair to attempt prolongation of life only to have the chronically ill and aging person reside in an institution that has no heart or soul or has any provision for easier and more convenient living.

At the Allegheny County Home and Hospital at Woodville, Pa., a rehabilitation service (of which I am consultant) was instituted by the Director, Dr. Gerald P. Hammill. This venture was risky at best, but the results have more than justified the financial and human expenditures. The degenerative diseases are certainly most frequently encountered and yet many arthritic patients have been returned to usefulness, either to their families or, in a smaller measure, to industry. The need for experienced artisans is so great that it is a shameful waste of man power to permit many of these capable, chronically ill persons to "vegetate" to institutions where their talents could be but are rarely used.

Dr. Dinken brings out vividly that trauma of the bones, joints and muscles is also cause for disabilities among these patients, and certainly care should be used in their rehabilitation. Too many of our patients in this institution have not been given the benefit of early mobility and ambulation, resulting in disabilities, many of which are avoidable. Vascular lesions constitute a great majority of these cases resulting in amputations of extremities and, even more frequently, hemiplegia. Early motivation, pulleys, reeducation, etc., have been so useful in the restoration of function that patients who had been bedridden even for years are now taught self care and have become ambulatory. It is a false impression that the great majority of these patients leave this institution, but many of those who will spend their remaining days there have had their own dignity and independence restored by the simple expediency of learning to walk, to care for their personal needs and, above all, to associate with other patients in the rehabilitation service.

It is unreasonable that we place so much stress on the group in the fifth decade and upward where now there are more patients who, by adequate social services, are being taken from homes where they have been hidden from public view. These patients, many of whom present neurologic problems, by adequate diet and medical care have been placed in condition for progressive physical medicine. Even the cardiac patient with his attendant incapacity can produce for himself if given the opportunity.

To this end and in support of Dr. Dinken's presentation, the Commissioners of Allegheny County have allotted $150,000 for a complete rehabilitation service for indigent people at another of its hospitals, at Mayview, Pa. The reduction in the number of attendants normal for bed patients and the discharge rate of patients from the rehabilitation service have resulted in savings which are not only economic but also — even more important — human. If one were to consider only financial savings, the entire venture would be operated on the basis of cold dollars and cents, but the hope that has been inculcated in these persons has been so great that this necessary expansion of facilities is vital because of the number of requests for such therapy.

I can disagree with Dr. Dinken in only one respect — when he states that "the vocational rehabilitation of the aged patient with a physical disability presents a difficult problem beyond the scope or intent of this paper." While it is, admittedly, a neglected phase, I believe, it is the obligation of the physiatrist to be skilful, not only in the physical and emotional rehabilitation of this group of patients, but also in the vocational. After all, a patient should not be considered rehabilitated unless he is able to get to a place of employment or instruction without human aid.

In conclusion, I feel that it is the obligation of all people in the field of physical medicine to prepare themselves for the complete rehabilitation not only of the aging and chronically ill but also of those younger persons who, too, need such services. This has been amply demonstrated by the efforts of Rusk and Deaver of New York, Krusen of Rochester and Bennett of Warm Springs

A PHYSICAL MEDICINE REHABILITATION HOSPITAL *

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Rehabilitation is a term which has acquired many meanings through usage in many settings. There have been rehabilitation programs in the Army, in the Army Air Forces, in various state and federal institutions and under private auspices, each geared to somewhat different objectives. The real confusion arises from the fact that rehabilitation is always a relative affair, to be defined in terms of the patient's personal or social effectiveness and in relation to various possible goals for overcoming his limitations.

Thus, rehabilitation could be, as it was in the Army, a program designed to restore delinquents to a better understanding of their responsibilities as soldiers. In another setting, rehabilitation may mean teaching an amputee to use an artificial limb. In this same setting, one might take a somewhat higher aim on the scale of personal effectiveness and add that rehabilitation also consists in helping the amputee to regard his disability with some measure of philosophic acceptance, so that he will have enough emotional stamina to meet the outside world adequately. One could also be justified in taking a still higher aim by stating that rehabilitation includes assisting that amputee to learn to do a job by means of which he can support himself and his family. Finally it is important to consolidate and preserve the physical, mental and vocational gains which might otherwise be corroded by the underlying social parasitism found in some chronically disabled persons. It may be necessary in such cases to take a still higher aim with a view toward teaching these poorly socialized persons how to live as responsible, civic-minded citizens in their communities. This would then present a concept of rehabilitation which encompasses three broad areas as follows: (1) physical reconstruction, the purpose of which is to return the patient to as near a normal state as possible; (2) psychologic adaptation, to resolve emotional disturbances which restrict working efficiency, and (3) community adjustment, to promote the habits of responsibility necessary to good citizenship. It would be possible to select any one of these objectives as a goal of rehabilitation, as many institutions and organizations do; but a distinction should be made between rehabilitative procedures which affect part activities or functions of the individual, and rehabilitative measures which are geared to the total individual in his relation to society.

When is a person a candidate for rehabilitation of this type, and why is it desirable that there be a distinct center for such rehabilitation?

It is generally acknowledged that a rehabilitation program makes its contribution at the point where definitive medical treatment is completed. That is the point at which the patient may be left with a dramatic deficiency in physical structure which requires radical new adjustments, such as learning to use an artificial limb, restoring muscle function or occupational retraining. The disability may be a chronic, prosaic one which, nevertheless, requires difficult adaptations because of the patient's previous style of living and conception of himself; or, the patient may be left with a damaged psyche which can grapple only ineffectively with real life problems. The patient is at the point where it is no longer necessary or wise that he remain in bed or inactive. There is little left that medicines or surgery can do. The

* Read at the Twenty-Sixth Annual Session of the American Congress of Physical Medicine, Washington, D. C., Sept. 8, 1948.

time for self pity is over. The patient must look ahead; he must build anew on what remains of the body and spirit; he must develop potentialities and capacities for new ways of living. The emphasis has shifted from being sick to becoming well in a personal, social and economic sense.

Continued care at this point in a conventional hospital is liable to bring diminishing returns in the form of mounting dependency and even regression. In order that the patient may come to grips with new adaptations and achieve growth, it is advisable that he move in an environment which resembles real life more than it does a conventional hospital. Yet the patient cannot return to his home, for community living makes harsh demands upon the still disabled; it lacks the technical facilities and the permissive atmosphere in which rehabilitation flourishes. That is the point at which a rehabilitation center enters the scheme. It is true that rehabilitation procedures could be added to the conventional hospital, but there is inestimable therapeutic value in actual physical separation from it to a new and totally different environment in the "no man's land" between definitive hospital and community.

Motivation and Dynamics in a Rehabiltiation Program

A rehabilitation program brings many things to the life of the patient, and in return it asks that the patient bring only one thing to the program. That one thing, which is looked for in each patient and which he must have if the facilities and activities are to have more than academic meaning, is motivation: the active desire to become as much of a normal human being as he possibly can. Patients of previously healthy motivation are frequently found to have bowed temporarily to adverse circumstances, but keen diagnosis can distinguish these patients from those who have been inadequately motivated all their lives. The latter are not a promising group, for psychiatrists are not magicians who can develop a spark where no tinder exists. Then also are found persons who have fortified their symptoms with the psychologic outlook of the professional patient. This is the man who has become an expert at living off the community or government. His motto in like is "give me," and he is a social parasite who lives on the substance of his fellow men.

The problem of motivation is more than a diagnostic consideration in evaluating an applicant for admission to a rehabilitation program. It is a consideration to which one must be constantly alert during the entire operation of the program. When there are forces in the very nature of sick or injury benefits, such as compensation and ready hospitalization, which destroy motivation, other forces must be devised to concel the destructive effects.

A rehabilitation program must necessarily be a protected experience in living while the patient is building up necessary reserves to cope with a competitive society. However, a protected experience in living can if administered unwisely foster dependency, encourage regression and reduce the capacity for independent living. If the rehabilitation experience is to result in growth toward independence, it should give the patient practice in growing or in preserving the independence he already possesses. In other words, rehabilitation is not a state of adjustment which occurs after treatment. Rehabilitation occurs during treatment. There must be a dynamic process constantly at work within the program which minimizes the infantilization inherent in every institutional program.

This process can be facilitated by an administrative approach to programing which tries to make a rehabilitation program resemble real life as

closely as is consistent with the needs of the patients. One may begin with administration because (1) within all phases of the program which affect patients there must be an internal consistency, and (2) the process sought can be most easily achieved if it is inherent in the very structure of the program and its activities. Otherwise there is a danger that "rehabilitation" becomes something which is administered incidentally by isolated persons who recognize the need and who have the talent or skill to administer it.

This administrative approach to programming must be evident in all activities, the little as well as the big, the ordinary as well as the dramatic. As examples, examine some of the matters which arise in the routine administration of a ward of patients and the management of recreation for patients.

In real life if a person is too ill to go to work, he must notify his shop or office early in the day. The employer expects the worker to have that kind of a responsible attitude toward his job. In the rehabilitation program if a patient feels too ill to attend classes, he, too, is expected to display a responsible attitude by notifying the proper authority within a reasonable period of time. If the ill person in real life goes to a physician who prescribes a pill every three hours, the patient does not return to the office every time he needs a pill. He obtains a supply from a drug store and takes the pills by himself at the prescribed hour. Rehabilitation patients are expected to exercise the same independence in the management of routine medication. The person in real life who wants to attend a movie does not have to ask for a "pass" signed by his mother or boss. He goes to a movie and returns at a reasonable hour so that he will be ready for the next day's work. It is believed that patients can gain practice in independence in the same way.

As in real life, there should be no separate "wards" or separate group activities for the patients whose problems are entirely or predominently psychiatric. To separate psychiatric patients from persons with other disabilities creates an unhealthy feeling of difference and isolation in a community which has one objective. This does not preclude an individual approach to each patient. It is believed, however, that by treating the psychiatric patient as a member of the general community his confidence in himself is preserved.

Finally, two psychologic advantages should be stressed, which frequently occur among psychiatric patients, who are not segregated: 1. The patient is reminded in a casual but impressive manner that, by virtue of being physically intact, he has a tremendous advantage over his fellowmen who are physically disabled. There is often no better antidote for the self pity and introspective rumination which block psychiatric patients. 2. The exposure to the severely disabled stirs up guilt feelings which create the anxiety to make the patient more accessible to psychotherapy and provide the psychiatrist with a tangible entry into the patient's psychologic problems.

What about recreation for the rehabilitation patient? Does a person in real life have a bevy of girls brought to the door of his home three nights a week for dances? Is he showered with free tickets for baseball games, clam bakes and radio broadcasts? Does he have a score of organizations planning recreational activities for him, anticipating and catering to his every whim in the way of play and fun? Hardly! He plans his own recreation; he writes to the broadcasting studio for tickets; he saves money for baseball games, and he competes for his own dates. There is a responsibility for arranging recreational outlets for patients who have no income while hospitalized and for patients who are not ambulatory. There is also

a responsibility for guidance to those who need help in learning initiative in recreational pursuits. However, there is a vast untapped area in institutional programing for encouraging independence, through play activities, which require the active participation of patients, as contrasted with the passivity enforced by commercial recreational outlets. As one final example, take the matter of birthday parties for patients. Instead of having the party arranged for them, could not the patients themselves organize parties, plan the food and the games and even bake the cake? May not this experience in doing something for another person stir up latent or undeveloped capacities for contributing to one's fellowmen instead of being on the "give me" end of life relationships? It is well to approach all standard hospital situations such as these in a fresh light, which asks, "How can this be made to contribute to change, growth and independence?"

There are other common, ordinary features of a rehabilitation program which lend themselves to developing the kind of process which acts as a stimulant to engaging the ego of the patient in the task of change and growth. It is customary procedure for each patient to have a schedule which he follows. The schedule could be regarded as a static list of activities, and the patient's failure to observe his schedule could be punished by restriction of privileges. On the other hand, the schedule could be regarded as a sample of life situations, as a chain of experiences which create recurrent tests and controls that bring out the feelings, attitudes and conflicts of the patient. Seen this way, a patient's failure to follow through with his schedule becomes a tangible episode around which his instructors can discuss his inertia and his blockings and around which his capacity to behave differently may be tested.

In addition to the academic content of the courses taught in education, much of the subject matter can be exploited to teach patients greater awareness of the world in which they live; to encourage them to evaluate themselves in relation to society; to help them think about human relationships. These are the goals of the most progressive institutions of learning, and they can readily be adapted to the major objectives of a rehabilitation program.

Thus, it is around the ordinary occurrences of daily living that one can create the administrative structure and process which elicit the participation of patients, which offer them the opportunity to exercise initiative and which thereby enable them to grow or to preserve their previous growth.

Conclusions

Finally, then, regardless of the type of patient being dealt with or the individual objective, it appears that rehabilitation is a constructive program set in motion after the completion of definitive medical treatment. On this point most authorities are agreed. The balance of the concept then depends upon the type of thinking to which one dedicates himself. There are on the one hand, "part" thinkers and, on the other, "whole" thinkers. The "part" thinkers direct their attention toward the treatment of only the affected area. On the other hand, the "whole" thinker not only consider the affected area but also extend their attention to those areas which may be indirectly or concomitantly involved. Even within the medical profession are found both types of thinkers — the "whole" and the "part." The "part" thinker teaches an amputee to use an artificial limb and then closes the case as recovered. The "whole" thinker regards the amputee as one who has lost his physical freedom. The "whole" thinker is also alert to the possible loss of his economic status, his social status, his physical attrac-

tion to his wife or family, his competitive spirit, his self confidence and his motivation to return to normal community living. With these things in mind, a program has been developed for the patient which is dedicated to the "whole" thinking concept about rehabilitation. It encompasses physical reconstruction and psychologic, social and vocational adaptations with a view toward returning the veteran to his own community as a useful, responsible and emotionally adjusted citizen.

The discussion of this article will be published in a later issue of the ARCHIVES.

THE EFFECTS OF THERAPEUTIC EXERCISE ON THE PERIPHERAL CIRCULATION OF NORMAL AND PARAPLEGIC INDIVIDUALS *

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It is common knowledge that muscular exercise increases the circulation in normal persons, but information is meager concerning the effect that exercise of normal upper extremities has on paralyzed lower extremities. Likewise, factors causing differences in quality and duration of exercise and their effects on the circulation have not been studied extensively. This is particularly true in the case of paralyzed extremities. This study was made in order to determine the effects of systematic therapeutic exercise on the circulation in normal and in paralyzed extremities in cases of spastic and flaccid paralysis. An attempt was made to evaluate (1) the immediate effects of exercise, (2) the effects of short periods of exercise and (3) the effects of prolonged training on the circulation of normal and of paralyzed extremities.

Repeatedly activated muscles develop an efficient blood supply. Either new capillaries appear, or hitherto unused capillaries open up. Krogh[1] reported a great increase in the number of patent capillaries in activated muscles. Bainbridge[2] noted that systematic exercise improved the whole muscular system and increased the range and delicacy of the adjustments of the

* Read at the Twenty-Sixth Annual Session of the American Congress of Physical Medicine, Washington, D. C., Sept. 8, 1948.

1. Krogh, August: The Anatomy and Physiology of Capillaries, ed. 2, New Haven, Conn., Yale University Press, 1929, 422 pp.

2. Bainbridge, F. A.: The Physiology of Muscular Exercise, London, Longmans, Green & Co., 1919.

respiratory and circulatory systems. Palladin[3] reported that muscular exercise increases the work capacity and the glycogen and creatine content of the muscles. Aerobic and anaerobic glycolyses are also increased by training. Ellis[4] reported an increase of 50 to 100 per cent in the velocity of blood flow and an increase of 130 to 190 per cent in the volume of blood flow over the resting value in subjects exercising the lower extremities by pedaling a stationary bicycle. By means of the venous occlusion plethysmograph Hewlett and Van Zwaluwenburg[5] obtained a marked increase in blood flow in one forearm by exercising it within the plethysmograph. They found that exercise of the arm opposite to the one within the plethysmograph produced little or no acceleration of the blood flow, whereas exercise of the arm within the plethysmograph increased the blood flow three to eight times over the control value.

Proger and Dexter[6] reported that exercising the muscles of the hand and forearm by opening and closing the fist consistently produced a considerable and rapid increase in the velocity of blood flow in the median basilic vein. However, they noted a quick decrease in velocity of blood flow as the exercise was discontinued. In contrast, the velocity of flow in the superficial vein was definitely slowed by the exercise. They suggested an antagonistic response between the superficial and deep veins of the arm during exercise. Increased metabolism in the muscles may have led to shunting of blood from the surface to deep structures. However, moderately severe exercise, involving chiefly the lower extremities (pedaling on a stationary bicycle), produced no change in the velocity of blood flow in the veins of the upper extremities. They concluded that in response to exercise the velocity of blood flow does not change equally in all parts of the circulatory system.

Abramson[7] and associates studied the blood flow in the forearm by means of the venous occlusion plethysmograph before and after a definite amount of exercise consisting of manual compression of an ordinary sphygmomanometer bulb a specified number of times in one minute. They determined the blood flow before exercise, immediately afterward and for ten to fifteen minutes thereafter. A definite increase in blood flow in the forearm was produced by the exercise.

Holck[8] observed that the endurance of the flexors of his forearm, during a long term experiment, continued to improve for several years. At the end of four and a half years, the endurance, measured on an ergograph of the Mosso type, had become 500 per cent of the original endurance. Hedvall[9] noted an increase of 819 per cent in fifty days of training of the arms on the Johansson ergograph.

Abramson[10] found that improvements in muscle strength produced by a training period were still in evidence, though considerably reduced, a year later.

Smart[11] stated that the contraction and relaxation of muscles during

3. Palladin, A. V.: The Biochemistry of Muscle Training, Science **10**: 576 (Dec. 7) 1945.
4. Ellis, L. B.: Circulatory Adjustment to Moderate Exercise in Normal Individuals, with Particular Reference to the Interrelation Between the Velocity and Volume of the Blood Flow, Am. J. Physiol. **101**:494 (Aug.) 1932.
5. Hewlett, A. W., and Van Zwaluwenburg, J. G.: The Rate of Blood Flow in the Arm, Heart **1**:87, 1909.
6. Proger, S. H., and Dexter, L.: The Continuous Measurement of the Velocity of Venous Blood Flow in the Arm During Exercise and Change of Posture, Am. J. Physiol. **109**:688 (Oct.) 1934.
7. Abramson, D. I.: Vascular Responses in the Extremities of Man in Health and Disease, Chicago, The University of Chicago Press, 1944, pp. 149; 262.
8. Holck, H. H. G.: Diet and Efficiency, Thesis, University of Chicago Monographs in Medicine, Chicago, The University of Chicago Press, 1929.
9. Hedvall, Bertel: Zur Kenntnis der Ermüdung und der Bedeutung der Übung für die Leistungsfähigkeit des Muskels, Skandinav. Arch. f. Physiol. **32**:115, 1915.
10. Abramson, Ernest: Ueber Muskelkraft und technische Fertigkeit während und nach einer Trainingsperiode, Arbeitsphysiol. **2**:148, 1929.
11. Smart, M.: The Influence of Muscle Action on Tissue Repair, Arch. Phys. Med. **28**:429 (July) 1947.

repeated activity makes them act as powerful pumping machines which contribute to the free passage of blood to various structures in the region. The blood supply to a muscle in action has been computed by physiologists to be at least eight times that required by a muscle at rest. Muscle action plays an important part in the efficiency of the circulation.

Methods

Normal and paraplegic adult persons volunteered for this study. The blood flow in the upper and lower extremities was determined by the use of the venous occlusion plethysmograph with the compensating spirometer recorder.[12] The parts of the upper extremities sealed in the plethysmographs included the hand, forearm and a portion of the arm to 1 inch (2.5 cm.) above the olecranon process. Each of the plethysmographs on the lower extremities covered the foot and leg up to 1 inch below the tibial tuberosity at the knee.

After a period of adaptation to the surroundings and plethysmographs (about thirty minutes), the subject was instructed to lie quietly while the control blood flow was established for each extremity. The "collecting cuff" used for venous occlusion during determination of blood flow is suddenly inflated to a pressure below diastolic yet above venous pressure to trap incoming arterial blood within the portion of the extremity in the plethysmograph. Similarly after the prescribed exercise was given the blood flow in the extremities was again determined and compared with the control on a percentage basis.

Several types of exercise were given, and their effects on the blood flow in the extremities were determined. When one limb was exercised, the effect on the circulation in the exercised and in the contralateral extremity was determined.

Short Periods of Exercise. — Several types of exercise for short periods were devised. In one type, two sets of exercise were given with the subject in the supine position on the test table: (1) Flexion of the two arms was done by having the subject grasp an overhanging bar, lift the trunk of the body off the table and touch the chin to the bar. This was repeated until the subject was no longer able to touch his chin to the bar. (2) This exercise consisted of the pushing of a weighted bar from the chest until the arms were in full extension. Sufficient weight was used to require maximal effort of the subject to lift the weight five to ten times. Exercises (1) and (2) were repeated alternately for a period of ten minutes with a rest of one minute sometime during the period.

In another series of observations, the exercise was performed either (1) by having the subject grasp with his hands rings suspended from overhead and repeatedly lift the whole body off the wheel chair a definite number of times or until he was fatigued or (2) by taking the patient to the gymnasium where routine conditioning exercises were done, immediately after which the blood flow in the normal upper extremities and paralyzed lower extremities was determined.

Another short set of exercises was performed to determine the effect of exercising one extremity on the blood flow in that and the contralateral extremity. A 40 pound (18.14 Kg.) or 20 pound (9.07 Kg.) weight, hung at the end of a rope which was passed over a simple pulley and then attached to a stirrup type of handle, was used. The subject, seated on a chair, grasped the stirrup handle and lifted the 40 pound weight off the floor as far up as possible by maximal flexion of the arm and internal rotation of the glenohumeral joint followed by full extension of the arm. This combination of flexion and extension of the upper extremity was performed at the rate of twelve times a minute for two minutes when a 40 pound weight was lifted and for four minutes when a 20 pound weight was used.

Long Periods of Exercise. — This consisted of the routine exercises performed in the gymnasium during reconditioning. In most instances the exercises included having the patients lift heavy weights, walk on sawed-off crutches or on the hands on the mat, lift the weight of the trunk and legs by chinning themselves on parallel bars, lift themselves to a standing position in the parallel bars, and walk on crutches. The type of exercises given varied for the different patients and depended on the degree of advancement in the rehabilitation program. Observations were divided into two groups. In one group the patient was instructed to go to the gymnasium and carry on the exercises for a period of one hour without any supervision.

12. Berry, M. R.; Baldes, E. J.; Essex, H. E., and Wakim, K. G.: A Compensating Plethysmokymograph for Measuring Blood Flow in Human Extremities, J. Lab. & Clin. Med. 33:101 (Jan.) 1948.

The second group of exercises was of the same type as the unsupervised, except that the patient was closely supervised by the physiatrist or physical therapist and encouraged to use maximal effort during the performance of the routine exercises described. They were performed during a period of thirty minutes instead of sixty and with several rest periods of one or two minutes between the different sets of exercises. To leave the advantage of the time factor with the observations of the unsupervised exercise, only half the time was used when the exercise was supervised.

In order to determine the effects of prolonged training on the circulation in the extremities, we measured the blood flow in the extremities at rest of several patients at the beginning of their rehabilitation program, and again under similar conditions after several weeks of training.

Results

Short periods of exercise involving both upper extremities of healthy subjects with normal upper and lower extremities consistently produced a significant increase in the blood flow in the exercised extremities. In the 4 subjects given short periods of exercise, the average increase in blood flow over the control flow in the left arm was 146 per cent, with a range of from +54 to +261 per cent. The average increase in the right arm was 110 per cent and the range of increase from +87 to +137 per cent. The blood flow in the unexercised normal lower extremities increased an average of 22 per cent in the left leg and 45 per cent in the right leg as a result of exercise of the upper extremities of these normal subjects. None showed any decrease in blood flow. The detailed data on short periods of exercise in normal persons are given in table 1.

TABLE 1. — *Effects of Short Periods of Exercise of Upper Extremities on Blood Flow in the Upper and Lower Extremities of Normal Persons.*

		Blood Flow Before Exercise		Blood Flow After Exercise		Difference Per Min.	
Subject	Extremity	Cc. Per Min.	Cc. Per Min. Per 100 Cc. of Tissue	Cc. Per Min.	Cc. Per Min. Per 100 Cc. of Tissue	Cc.	Per Cent
1	Left arm	130	8.1	200	12.5	+70	+54
	Right arm	103	6.4	214	13.4	+111	+108
	Left leg	173	5.4	178	5.6	+5	+3
	Right leg	103	3.2	133	4.2	+30	+29
2.	Left arm	116	7.3	284	17.7	+168	+145
	Right arm	155	9.7	326	20.4	+171	+110
	Left leg	100	3.2	171	5.5	+71	+71
	Right leg	64	2.0	130	4.2	+66	+103
3	Left arm	152	9.5	341	21.3	+189	+124
	Right arm	191	11.9	358	22.4	+167	+87
	Left leg	92	3.5	97	3.7	+5	+5
	Right leg	112	4.3	159	6.1	+47	+42
4	Left arm	101	5.0	365	18.3	+264	+261
	Right arm	104	5.2	246	12.3	+142	+137
	Left leg	88	3.5	98	3.9	+10	+11
	Right leg	80	3.2	84	3.4	+4	+5

Exactly the same short periods of exercise given to the normal subjects were given to 13 paraplegic volunteers. The blood flow in the upper extremities of the paraplegic patients increased as it did in normal subjects. The average increase in flow over the control value in the left arm of the paraplegic patient was 170 per cent, and the range of increase was from +32 to +299 per cent. In the right arm the average increase was 135 per cent, with a range of +62 to +288 per cent. In a few of the paralyzed lower extremities there was a slight decrease in the circulation, but the changes, whether increases or decreases, were not marked. The average change in flow in the lower extremities of the 13 paraplegic patients was +11 per cent

TABLE 2. — *Effects of Short Periods of Exercise of Upper Extremities on Blood Flow in the Upper and Lower Extremities of Patients with Paralyzed Lower Extremities.*

Subject	Extremity	Blood Flow Before Exercise Cc. Per Min.	Cc. Per Min. Per 100 Cc. of Tissue	Blood Flow After Exercise Cc. Per Min.	Cc. Per Min. Per 100 Cc. of Tissue	Difference Per Min. Cc.	Per Cent
5	Left arm	40	3.5	136	11.6	+96	+240
	Right arm	55	4.8	111	10.5	+56	+102
	Left leg	72	3.1	70	3.0	—2	—3
	Right leg	63	2.7	94	4.1	+31	+49
6	Left arm	57	3.6	133	8.3	+76	+133
	Right arm	52	3.2	141	8.8	+89	+171
	Left leg	135	6.0	87	3.9	—48	—36
	Right leg	173	7.4	128	5.7	—45	—26
7	Left arm	189	14.5	254	19.5	+65	+34
	Right arm	137	10.5	239	18.4	+102	+74
	Left leg	82	4.2	125	6.3	+43	+52
	Right leg	75	3.8	84	4.3	+9	+12
8	Left arm	92	4.4	182	8.7	+90	+98
	Right arm	63	3.0	103	4.9	+40	+63
	Left leg	53	2.4	52	2.4	—1	—2
	Right leg	44	2.0	45	2.0	+1	+2
9	Left arm	56	3.2	74	4.4	+18	+32
	Right arm	58	3.4	158	9.3	+100	+172
	Left leg	82	4.5	52	2.9	—30	—37
	Right leg	48	2.8	53	3.1	+5	+10
10	Left arm	50	3.1	111	6.9	+61	+122
	Right arm	46	4.6	132	13.2	+86	+187
	Left leg	46	3.1	72	4.8	+26	+57
	Right leg	57	3.8	76	5.1	+19	+33
11	Left arm	50	3.0	165	9.4	+115	+230
	Right arm	54	3.1	131	7.5	+77	+143
	Left leg	134	5.7	136	5.8	+2	+1
	Right leg	87	3.7	81	3.4	—6	—7
12	Left arm	87	4.5	150	7.8	+63	+72
	Right arm	72	4.3	120	7.1	+48	+66
	Left leg	44	2.2	47	2.4	+3	+7
	Right leg	37	2.1	41	2.3	+4	+11
13	Left arm	97	3.2	343	11.2	+246	+254
	Right arm	127	4.2	226	7.9	+99	+78
	Left leg	34	0.9	64	1.8	+30	+88
	Right leg	46	1.3	56	1.5	+10	+22
14	Left arm	28	1.8	90	5.6	+62	+221
	Right arm	23	1.4	55	3.4	+32	+139
	Left leg	114	4.2	105	4.3	—9	—8
	Right leg	68	2.8	58	2.4	—10	—15
15	Left arm	42	1.7	158	6.5	+116	+276
	Right arm	43	1.8	167	6.8	+124	+288
	Left leg	91	2.1	82	1.9	—9	—10
	Right leg	75	1.7	100	2.3	+25	+33
16	Left arm	84	4.0	335	15.2	+251	+299
	Right arm	102	4.6	312	14.2	+210	+206
	Left leg	61	2.8	84	3.8	+23	+38
	Right leg	78	3.5	84	3.8	+6	+8
17	Left arm	124	5.9	375	17.9	+251	+202
	Right arm	149	7.1	242	11.5	+93	+62
	Left leg	134	5.2	134	5.2	0	0
	Right leg	130	5.0	135	5.2	+5	+4

in the left leg and +10 per cent in the right leg. The data in detail on the 13 paraplegic subjects who volunteered for this study are given in table 2.

The control blood flow in the extremities of 5 paraplegic subjects was

established at the start of the training period for rehabilitation. After several weeks of routine rehabilitation exercises, as specified in table 3, the blood flow was again determined under similar conditions. It is definitely shown that in the normal upper extremities of every subject a significant increase in the blood flow occurred as a result of routine training. The blood flow in the paralyzed lower extremities of 2 of the subjects was reduced at the

TABLE 3. — *Effects of Repeated Therapeutic Exercise on the Blood Flow in Normal and Paralyzed Extremities.*

Subject	Extremity	Blood Flow at Beginning of Training Period			Blood Flow at End of Training Period		Difference Per Min.	
		Cc. Per Min.	Cc. Per Min. Per 100 Cc. of Tissue	Period of Training, Wk.	Cc. Per Min.	Cc. Per Min. Per 100 Cc. of Tissue	Cc.	Per Cent
18	Left arm	42	2.4	6	124	7.1	+82	+195
	Right arm	49	2.8	....	114	6.5	+65	+133
	Left leg	155	6.6	....	98	4.2	—57	—37
	Right leg	96	4.1	....	89	3.8	—7	—7
19	Left arm	42	1.7	4	80	3.3	+38	+90
	Right arm	43	1.8	....	109	4.5	+66	+153
	Left leg	91	2.1	....	173	3.9	+82	+90
	Right leg	75	1.7	....	158	3.6	+83	+110
20	Left arm	43	3.3	24	65	4.5	+22	+51
	Left leg	94	4.8	....	138	6.9	+44	+47
21	Left arm	29	1.8	8	168	10.5	+139	+479
	Right arm	50	3.1	....	224	14.0	+174	+348
	Left leg	72	3.2	....	59	2.6	—13	—18
	Right leg	61	2.7	....	38	1.7	—23	—38
22	Left arm	38	2.9	8	189	14.5	+151	+397
	Left leg	79	4.1	....	82	4.2	+3	+4

end of the period of training. Two subjects had a good increase in the circulation in the paralyzed lower extremities, and 1 had practically no change. Evidently paralyzed extremities do not uniformly get their share of the beneficial effects of therapeutic exercise. In fact, atrophy progresses in the seriously involved limb. Table 3 gives the data in detail on each of these subjects.

To determine the influence of supervision, we prescribed therapeutic exercises with and without medical or technical supervision to 6 paraplegic subjects whose upper extremities were normal. Among the errors in exercise prescription pointed out by Keys,[13] lack of precise instructions and failure to observe the effects of the exercise on the patient and insufficient dosage of exercise were stressed. In our control studies blood flow was taken in the left arm before exercise and immediately after exercise. In every case the percentage increase of blood flow in the tested arm (left arm) was greater when the exercise was done under supervision than when it was not supervised. In fact, on two occasions when no supervision was given, there was a slight reduction, namely —4 per cent and —9 per cent, in blood flow (table 4). The average increase in the left arm after supervised exercise over the control blood flow was 155 per cent, whereas the same arm averaged an increase of only 43 per cent after unsupervised exercise. This indicates clearly that when no supervision was given subjects exercised either insufficiently or not at all. The same persons (subjects 24 and 26) who gave negative results when their exercise was not supervised gave marked increases under supervision, namely +182 per cent and +194 per

13. Keys, Ancel: The Physiology of Exercise in Relation to Physical Medicine, Arch. Phys. Med. 26:633 (Oct.) 1945.

TABLE 4. — *Comparative Effects of Supervised and Unsupervised Therapeutic Exercise on Normal Upper Extremities in Cases of Paraplegia.*

Subject	Extremity	Blood Flow Before Exercise — Cc. Per Min.	Blood Flow Before Exercise — Cc. Per Min. Per 100 Cc. of Tissue	Blood Flow After Exercise — Cc. Per Min.	Blood Flow After Exercise — Cc. Per Min. Per 100 Cc. of Tissue	Difference — Per Min. — Cc.	Difference — Per Min. — Per Cent	Supervision
23	Left arm	39	3.1	63	5.0	+24	+62	Yes
	Left arm	83	3.6	103	8.3	+20	+24	No
24	Left arm	118	6.0	333	17.0	+215	+182	Yes
	Left arm	160	8.2	207	10.6	+47	+29	No
	Left arm	157	8.1	150	8.1	—7	—4	No
25	Left arm	69	3.6	210	10.1	+141	+204	Yes
	Left arm	123	6.5	382	20.0	+259	+211	Yes
	Left arm	125	6.6	185	9.2	+60	+48	No
26	Left arm	48	3.4	141	10.1	+93	+194	Yes
	Left arm	82	5.8	75	5.4	—7	—9	No
27	Left arm	142	8.1	240	13.7	+98	+69	Yes
	Left arm	64	3.7	100	5.7	+36	+56	No
	Left arm	60	3.4	96	5.5	+36	+60	No
28	Left arm	54	4.5	142	11.8	+88	+163	Yes
	Left arm	35	2.9	83	6.9	+48	+137	No

cent, respectively. This clearly shows that mere prescription of exercise is not sufficient; it must be followed up if it is to be effectively performed. The patient must perform the exercise conscientiously, if any benefit is to be expected from it. Mere dictation of the procedure of therapeutic exercise to the patient does not suffice.

The effects of exercise of one upper extremity on the blood flow in both upper extremities were studied by varying the duration and the strenuousness of the exercise (for example, by increasing the weight lifted). When the weight lifted was 40 pounds, the average increase in blood flow was 120 per cent in the arm that was exercised for two minutes. The contralateral unexercised arm showed an increase of 43 per cent over the control blood flow taken immediately before the exercise. When the weight lifted was only 20 pounds and the duration of the exercise was four minutes, the average increase in blood flow in the exercised arm was 66 per cent and in the contralateral unexercised arm only 1 per cent over the control blood flow prior to the exercise. The data on the individual subjects are given in tables 5 and 6. The more strenuous exercise produced by lifting double the weight for half the time produced a greater increase in blood flow, not only in the exercised arm but also in the contralateral unexercised arm. This confirms the opinion of Hellebrandt and associates.[14] In their report on the influence of unilateral exercise on the contralateral limb, they stated that the unexercised extremity is not unexercised. It participates in the reflex figure with which powerful unilateral contractions are associated. They concluded that unilateral heavy resistance exercise of one limb has a strikingly similar concomitant effect on the contralateral unpracticed limb and that the determining causal factor in so-called cross education is the severity of the effort evoking the response rather than the duration of the exercise. Cross education is produced by diffusion of motor impulses to the unpracticed side via irradiation and tonic postural reflexes, arising in and acting on the limbs but modulated by reflex mechanisms located in the brain stem.

14. Hellebrandt, F. A.; Parrish, A. M., and Houtz, S. J.: Cross Education; Influence of Unilateral Exercise on Contralateral Limb, Arch. Phys. Med. 28:76 (Feb.) 1947.

TABLE 5. — *Effects of Lifting 40 Pounds for Two Minutes by One Upper Extremity on Blood Flow in Both Upper Extremities.*

Subject	Extremity	Blood Flow —Before Exercise— Cc. Per Min.	Cc. Per Min. Per 100 Cc. of Tissue	Blood Flow —After Exercise— Cc. Per Min.	Cc. Per Min. Per 100 Cc. of Tissue	Difference Between Extremities Cc. Per Min.	Per Cent Exercised	Per Cent Not Exercised
29	Right arm*	45	3.0	156	10.5	+111	+247	.....
	Left arm	38	2.5	98	6.5	+60	.....	+158
30	Right arm	100	6.8	156	9.6	+47	.....	+43
	Left arm*	152	9.5	222	13.8	+70	+46	.....
31	Right arm*	120	6.0	177	8.8	+57	+48	.....
	Left arm	122	6.1	108	5.4	—14	.....	—11
32	Right arm*	126	6.0	269	12.8	+144	+143	.....
	Left arm	154	7.3	198	9.4	+44	.....	+29
33	Right arm*	108	5.4	278	13.9	+170	+157	.....
	Left arm	112	5.6	98	4.9	—14	.....	—13
34	Right arm*	154	7.7	274	13.7	+120	+78	.....
	Left arm	160	8.0	192	9.6	+32	.....	+20
35	Right arm*	156	7.4	337	16.0	+181	+116	.....
	Left arm	121	5.8	131	6.2	+10	.....	+8
36	Right arm*	62	3.5	159	9.1	+97	+156	.....
	Left arm	73	4.2	91	5.2	+18	.....	+25
37	Right arm*	146	8.3	323	18.4	+177	+121	.....
	Left arm	90	5.1	204	11.6	+114	.....	+127
						Average	+120	+43

* Exercised arm.

TABLE 6. — *Effects of Lifting 20 Pounds for Four Minutes by One Upper Extremity on Blood Flow in Both Upper Extremities.*

Subject	Extremity	Blood Flow —Before Exercise— Cc. Per Min.	Cc. Per Min. Per 100 Cc. of Tissue	Blood Flow —After Exercise— Cc. Per Min.	Cc. Per Min. Per 100 Cc. of Tissue	Difference Between Extremities Cc. Per Min.	Per Cent Exercised	Per Cent Not Exercised
30	Right arm	130	8.1	120	7.5	—10	.....	—8
	Left arm*	152	9.5	194	12.1	+42	+28	.....
31	Right arm*	83	4.1	114	5.7	+31	+37	.....
	Left arm	71	3.5	89	4.4	+18	.....	+25
34	Right arm*	136	6.8	238	11.9	+102	+75	.....
	Left arm	154	7.7	122	6.1	—32	.....	—21
35	Right arm*	87	4.1	164	7.8	+77	+89	.....
	Left arm	129	6.1	126	6.0	—3	.....	—2
36	Right arm*	88	5.5	171	10.7	+83	+94	.....
	Left arm	92	5.7	106	6.6	+14	.....	+15
38	Right arm*	147	8.9	204	12.3	+57	+39	.....
	Left arm	115	7.0	114	6.9	—1	.....	—9
39	Right arm*	102	4.3	195	8.3	+93	+91	.....
	Left arm	131	5.6	137	5.8	+6	.....	+5
40	Right arm*	123	6.1	222	11.1	+99	+80	.....
	Left arm	150	7.5	153	7.6	+3	.....	+2
						Average	+66	+1

* Exercised arm.

Comment

From a clinical standpoint our studies indicate that exercise of the normal upper extremities does not materially change the circulation of the paralyzed extremities, and neither is there evidence that it influences atrophy of muscle or bone in the paralyzed limb.

However, this study suggests that if patients who have normally innervated immobilized extremities could safely exercise the free extremities through the use of heavy resistive exercise they might thereby reduce atrophy of disuse and loss of power in the immobilized extremities and maintain a better general physical condition.

The fact that fairly strenuous exercise is necessary to increase circulation in a normal person is important clinically. This indicates that in most instances patients should receive exercises the strenousness of which is commensurate with their ability and physical condition and the degree of strenuousness should be increased gradually. To do otherwise may not increase their endurance and power.

It was evident from these studies that exercise, particularly heavy resistance and other strenuous exercise, must be constantly supervised and reevaluated by the physiatrist. Without this medical supervision, physical therapists may prolong a routine of exercise no longer maximally effective. Furthermore, unless supervised, the patient tends to do the exercise slowly and irregularly and probably does not benefit at all, or if he is benefited it is only by longer periods of treatment.

Summary

Therapeutic exercises of various grades of severity and duration were given to normal and to paraplegic persons, and their effects on the circulation in the extremities were studied by means of the venous occlusion plethysmograph with a compensating spirometer recorder. A comparison was made of the effects of the exercises on the circulation in the normal and in the paralyzed extremities. In the normal subjects, the exercised upper extremities showed an average increase of 146 per cent in blood flow of the left arm and of 110 per cent in the right arm. Exercise of the upper extremities of normal subjects produced an average increase of 22 per cent in the blood flow of the left leg and 45 per cent in the right leg.

Identical exercises given to paraplegic subjects produced similar increases in blood flow in the upper extremities. The average increase was 170 per cent in the left arm and 135 per cent in the right arm. The paralyzed lower extremities of some subjects showed slight decreases and slight increases but neither change was marked.

After several weeks of rehabilitation, during which therapeutic exercises were performed regularly, the normal extremities showed a definite and uniform increase in the circulation, while the effect on the paralyzed extremities was not uniform.

When exercise of one upper extremity consisted in lifting of a heavy weight (40 pounds), the contralateral unexercised upper extremity showed a good increase in blood flow immediately after the exercise; whereas when the weight lifted was only 20 pounds, even though the duration of the exercise was doubled, the increase of blood flow in the contralateral unexercised extremity was insignificant.

When the effects of supervision and no supervision were compared, it was observed that in every case the percentage increase in blood flow in the tested extremities was greater when exercise was carried out under medical or technical supervision than when it was not supervised.

Discussion

Dr. Hans Kraus (New York): The type of research represented by this paper is especially valuable for us who are interested in both the theory and the practice of therapeutic exercises. Results of this paper explain some of our practical work and give a sounder foundation for some of it.

I have been especially interested in the section to determine the influence of supervision of prescribed therapeutic exercises. We have always felt that the best prescription of exercises is useless unless followed by effective performance. We have always felt that the distribution of leaflets and the giving of a few instruction periods fall equally short of the goal. At the Institute for Rehabilitation and Physical Medicine, New York University, we have the practice of prescribing a very well defined exercise program and of sticking to the prescribed movement and movement-form as long as necessary for optimum results. Even when the patients are completely indoctrinated, we insist on supervision until the optimum results have been obtained, and when possible we follow up with supervision at least twice a week for outpatients until we can be reasonably sure that the desired result has been made permanent. This biweekly workout under supervision finds its theoretical basis in Peder and Palmen training graphs. Dr. Elkins and his associates have been investigating muscle power primarily. I wonder how they feel about exercises for muscle elasticity, such as stretching of contractures and relaxing for spasticity and how they feel about the principle of supervision in coordination exercises. As far as supervision goes our approach for the treatment of these muscle qualities follows closely the one used in power building exercises.

Dr. Elkins (closing): We have done no investigative studies in regard to elasticity of muscles in contractures and spasticities. However, it is quite obvious, from clinical observations, that active exercises of the normally innervated muscles would not have much effect upon a paralyzed spastic extremity. However, passive exercise of the paralyzed extremities by means of stretching may be very important. Active exercise of the normal portion of the body may have an effect, indirectly, on the paralyzed extremities, owing to the fact that when the patient becomes very active in handling himself, he may reduce some of the contractures and involvement of soft tissues.

Clinical observation does lead us to believe that active exercise, in a limited degree, may lead to diminution of the spasticity in the paralyzed extremities. This would depend upon whether there was partial control or total loss of control. Whether reduction of spasticity is due to fatigue or the result of some central action or whether it is due to reeducation of the individual to control his spasticity in certain instances is not quite clear.

I think the supervision of the reeducation exercises in spastic paralysis or paresis is extremely important. Certainly a patient usually is not capable of doing reeducation exercises by himself, and the supervision by the physical therapist or physician is extremely important in these cases and probably as important, if not more important, than it is in the heavy resistance exercises.

RELIABLE EVIDENCE FOR ACCEPTANCE OF DEVICES FOR PHYSICAL MEDICINE *

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CHICAGO

Thumping a watermelon is a time-honored method of testing its ripeness. Yet, how often one has had the unfortunate experience of selecting an emerald-striped, plump melon after thumping a dozen or so offerings at a market only to find in the end that the melon was not ripe. After several such experiences, one reluctantly comes to the conclusion that perhaps there is much to be desired in the method. Plugging of the fruit and actually inspecting the inside or "meat" is more accurate. Tasting the sample is still better, but even then one is not sure that the melon is free of a hard white center. One has to cut open a melon and taste it to be absolutely sure that it suits one's palate. Now, one has only the other diners to worry about. Finally, if nine out of ten connoisseurs of melons agree that a melon is pleasing to the taste, one can proclaim with a reasonable degree of assurance that the melon is indeed ripe and edible.

Aside from the selection of a prize fruit at a horticultural fair where there is keen competition, it is highly doubtful that anyone would go to so much trouble to select an edible watermelon, but the procedure serves as an analogy to explain the limit an investigator should go to in examining therapeutic equipment. The investigator should be objective rather than subjective.

The practice of medicine is an art, and the conscientious physician endeavors to utilize scientific facts and procedures in his practice. Hence, the art of medicine is a superstructure built on the foundation of medical science. The evidence to substantiate the value of a therapeutic procedure is frequently difficult to obtain. In the past, the value of therapeutic agents has not always been found by orderly scientific investigations. Much of the medical knowledge handed down to posterity has been discovered by "muddling through" rather than by prosecuting a prescribed discipline to establish facts while being guided by a planned hypothesis.

When submitting apparatus to the Council on Physical Medicine for investigation, the manufacturer is asked to write a formal request for consideration of the device or method on the firm's own stationery. The request shall be accompanied by: (*a*) a complete unit as it is supplied to the trade; (*b*) a complete description of the construction of the device submitted or of the method proposed, together with the trade name; (*c*) a statement of the physical claims and sufficient evidence to support the claims made; (*d*) a statement of the therapeutic claims advanced for the device or method and sufficient evidence to support the claims made; (*e*) the patent number, and (*f*) thirty copies of each advertising and descriptive booklet, pamphlet or other descriptive matter pertaining to this device or method.

The Council on Physical Medicine does not charge for consideration of an apparatus or method. Furthermore, its members and consultants donate their time, energy and skill without any remuneration. This devotion by the members of the Council and of its consultants to the advancement of scientific medicine is one of the most important ramparts of the Council.

* Read at the Twenty-Sixth Annual Session of the American Congress of Physical Medicine, Washington, D. C., Sept. 8, 1948.

With the exception (c) and (d) — and especially (d), therapeutic claims — the requirements for consideration are usually understood.

Reliable critical evidence is oft-times difficult to obtain, especially for apparatus used in physical medicine. Karsner and Goldblatt[1] have pointed out that the investigator is not merely a personality or a person but that he must be one who by training, experience, initiative, imagination, controlled curiosity and intellectual honesty is qualified to undertake an objective examination of the matter in hand without preconceived ideas or prejudice. The success or failure of any form of therapy or therapeutic agent in human medicine is decided by its action on living tissues. Thus, the evaluation of a treatment is measured not by the opinions of the physician but rather by the facts he can demonstrate. It is difficult at times to determine whether the psychic value of a new remedy is more pronounced than its physical value. In human experimentation the psychic factor must be reckoned with — and at least two means have been suggested by which this can be accomplished — namely (1) the statistical method and (2) the comparative or blind test. As Sollmann[2] has pointed out in the statistical method, alternate patients receive or do not receive the treatment. Owing to the individual variations and psychic factors, this method requires an extremely large number of observations to yield reliable results.

In the comparative or blind test, one series of patients is treated with the agent under consideration and the other is treated similarly but with inactive agents, masked in such a way as to be indistinguishable by both the patient and the experimenter. One will observe that this is easily accomplished by the use of drugs, but with physical therapeutic agents while it can be done, in many instances it is not quite so easy. Ultraviolet radiation equipment affords one example. One series of patients might be treated with rays that are unscreened or have passed through glass which transmits ultraviolet radiation. The other series is treated with rays that have passed through glass which is impermeable to the ultraviolet portion of the spectrum. The physician selected to evaluate the results would not know which patients had been treated by the potent radiation or with the impotent rays. He would be asked to pick out those patients that had been treated with the active agent and those that had not. A score of 50/50 would not suffice because statistically it is possible to accomplish this by no treatment at all. The physician would be expected to get at least 85 to 90 per cent of the patients catalogued correctly that were treated with the potent agent.

Animal experimentation is frequently used, and usually the psychic aspect of a problem is not a factor in evaluating the result. As pointed out, the promoter is asked to submit evidence to substantiate the claims made for the product or method. The burden of proof rests on the proponent. Letters from physicians are of value. However, the Council does not regard letters containing the opinions of the physicians as evidence. These letters do assist the investigators for the Council to determine something about the apparatus or method and at least to find out whether the equipment is standing up and has been used clinically.

In conclusion, the investigator of a therapeutic device or method should proceed objectively rather than subjectively. The evaluation of a treatment is governed not by the opinions of a physician but rather by the facts he can demonstrate.

1. Karsner, Howard T., and Goldblatt, Harry: Evaluation of Methods Used in Physical Therapy in Handbook of Physical Therapy, Chicago, American Medical Association, 1939.
2. Sollmann, Thorald: The Crucial Test of Therapeutic Evidence, J. A. M. A. 89:198 (July 21) 1927.

THE USE OF A COLD ROOM IN TREATMENT OF HYPERPYREXIA AND BURNS *

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and

VINCENT DE LALLA, JR., M.D.

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The mechanisms for heat exchange of the human body are so well adjusted in the normal person that if external temperature changes are not too great regulatory processes will maintain a relatively constant body temperature.

Constancy of the body temperature requires a fine balance between the heat generated in metabolic processes and the heat dissipated from the surfaces in contact with the generally cooler and drier external environment. Therefore, body temperature will rise if more heat is generated than can be lost in a period of time, or if the external temperature and humidity rise to a point where heat loss is greatly diminished or stopped completely.

The first condition is frequently seen in disease; the latter rarely met with in temperate zones. Occasionally, however, both are imposed on the same person, and the result is an extreme hyperpyrexia which will end fatally unless effectively combated. By whatever means the body temperature becomes elevated, the oxygen consumption increases in accordance with Van't Hoff's law.

The purpose of this paper is to present a case in which exactly such conditions prevailed and to describe a convenient and practical method for treating such a patient.

Report of a Case

L. R., a 30 year old married white man, received third degree burns which were estimated to involve over 50 per cent of his body area (fig. 1). In order to maintain pressure over the burns, it was necessary to apply bandages over approximately 85 per cent of his surface area.

This patient, therefore, not only had 50 per cent of his surface area burned, but the effectiveness of 85 per cent of his total surface area was seriously diminished in its ability to lose heat.

The environmental temperature then became of critical significance in the treatment of this patient. He was admitted at 4:30 a. m. on June 28, 1947, a period when peak midday temperatures of 90 F. were occurring. Within twenty-four hours of admission it became apparent that his febrile state was perhaps the greatest challenge to his existence. At 4:00 p. m. on June 29, thirty-six hours after admission, the temperature of his hospital room was 94 F., and he had a body temperature of 106 F., with shallow respirations at the rate of 60 per minute. During the night the external environmental temperature decreased to 74 F., and there was a corresponding decrease in body temperature of 3 degrees, as shown in figure 2.

The following morning, June 30, the room temperature was 90 F., and the patient's temperature remained near 105 F., and the respiration rate at 60 per minute. His condition became critical, consciousness lapsed and all efforts to reduce his body temperature by fans, cold sponging of all available skin areas and oxygen tent were unsuccessful.

At 3:45 p. m. on this day his temperature was 103.6 F.; the pulse was weak and

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* This work was carried out under a contract between the Office of Naval Research and the University of Rochester School of Medicine and Dentistry.

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irregular at 160 per minute; respirations were 60 per minute and were shallow and abdominal in nature. He was moved to the cold room, whose initial temperature was 82 F. At 4:00 p. m. cooling was started and the room temperature dropped to 62 F. within fifteen minutes, with a corresponding rapid lowering of the relative humidity from 70 to 48 per cent.

The patient's body temperature and pulse rate responded immediately to the drier and cooler room air, as may be seen in figure 2 and within ninety minutes his temperature

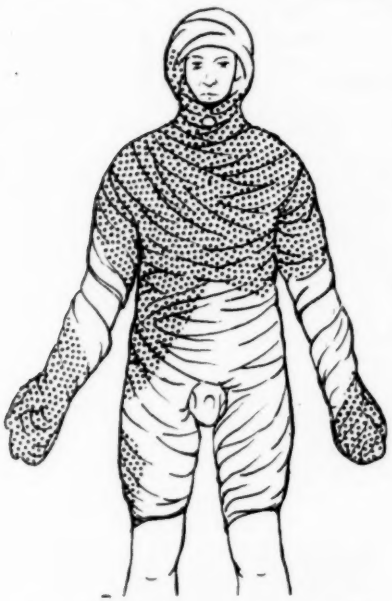

Fig. 1. — Schematic representation of burned and bandaged areas. Dots show location of burns.

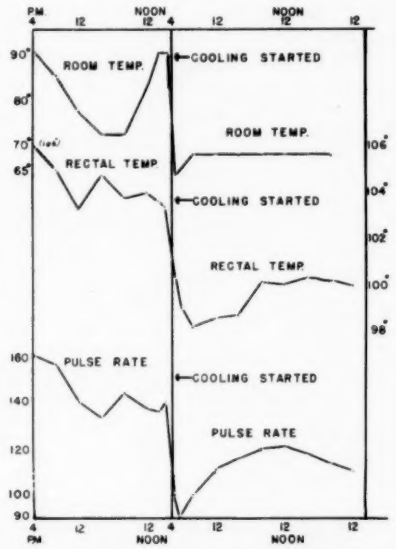

Fig. 2. —Patient's response to a cool and dry environment. Of particular interest is the marked drop in rectal temperature and pulse rate within thirty minutes after cooling was started.

was 98.6 F., and the pulse rate 90 per minute. The respirations became deeper and slowed to 22 per minute. Consciousness returned at this time and the patient complained of feeling chilly; the room temperature was accordingly raised to 68 F. and kept there for the duration of his stay in the cold room. His temperature and pulse gradually rose to levels of 100 to 101 F. and 110 to 120 per minute, respectively, but he never again lost consciousness and the body temperature and pulse did not rise to the critical levels they had reached prior to cooling. Figure 3 shows records of the patient's body temperature and pulse rate for the three and one-half day period he was kept in the cold room.

Thereafter his problem was one of long and difficult fluid balance and plastic surgery, which will constitute a separate report by the department of surgery. The total hospitalization was one hundred and seven days, and the patient was eventually discharged with completely healed skin.

Description of Cold Room

We have constructed a well lighted glass-paneled room of 1,000 cubic foot capacity, the primary purpose of which is to permit the study of the effects of lowered environmental temperatures upon the hemodynamics of the human body. The room was made large enough and placed adjacent to the hospital wards in order that effects of controlled lowered temperature and humidity could conveniently be applied to patients when such conditions appeared to be desirable. Figure 4 shows the room with recording apparatus. A 1½ horse power compressor situated in an adjacent room is used as the

cooling unit, and temperatures as low as 40 F. and as high as 110 F. may be achieved, and any desired humidity obtained. The room lends itself adequately to many experimental and therapeutic procedures.

Comment

The use of heat or cold as a therapeutic agent in the treatment of injured tissue has long been described in the literature. The work of Blalock and

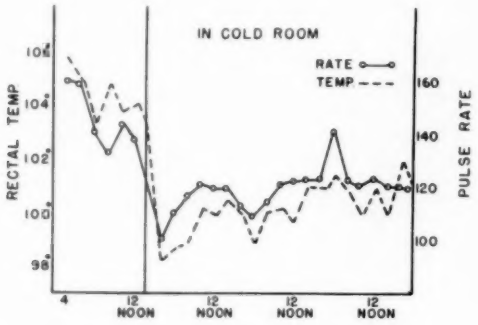

Fig. 3. — Rectal temperature and pulse rate for twenty-four hours preceding patient's transfer to the cold room and for the three and one-half days he remained there.

Mason[1] in 1941 was very instrumental in stimulating both discussion and further work on the use of cold and heat in the various states of shock.

Temple Fay[2] was one of the earliest workers in the general field of cryo-

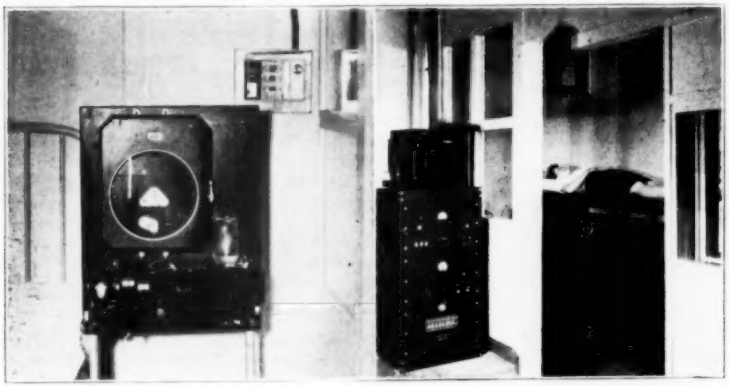

Fig. 4. — Two views of the cold room. (The ballistocardiograph table at the right has no bearing on this article; the continuous temperature and humidity recorder shown in the view at the left is an essential part of the equipment.)

therapy; in a communication to the Journal of the American Medical Association[3] he said: "After all these years, 'refrigeration' appears to be coming into wider appreciation and some day, I hope to see what 'refrigeration' will do for burns. It controls pain, prevents infection, diminishes shock and de-

1. Blalock, A., and Mason, M. F.: Arch. Surg. **42**:1054, 1941.
2. Fay, T., and Henny, G. C.: Surg., Gynec. & Obst. **66**:512, 1938. Fay, T.: New York State J. Med. **40**:1350, 1940.
3. Fay, T.: Letter to the editor, J. A. M. A. **121**:1109, 1943.

creases loss of serum. In addition the scar formed is pliable and soft rather than hard and firm."

The stimulus which the war gave to investigation of burns led to a great deal of experimental work on the effect of lowered environmental temperature on the mortality of extensive burns in animals. Elman and co-workers[4] demonstrated (1942) that severely burned rats (75 per cent of their skin area) did best at an environmental temperature of 75 F. The mortality rate at this temperature ranged from 25 to 32 per cent, as compared with 100 per cent mortality when the burned animals were subjected to environments of 32, 55 and 99 F. Also in 1942 Rosenthal[5] described similar effects of local cooling on the mortality of burn shock.

In 1943 Sellers and Willard[6] found a definite reduction in the mortality of burned dogs when the affected extremity was cooled after a plaster bandage had been applied. The same year Allen and co-workers[7] noted that the need for pressure bandaging was reduced when the affected area was cooled by ice or by electrical refrigeration.

In 1945 Bergman and Prinzmetal[8] reported that the optimum temperature range for survival in burn-shocked mice was 65 to 71 F. They offered evidence attributing the deleterious effect of a hot environment to a greater decrease in blood volume and an increase in capillary atony and visceral congestion.

It is evident that the use of a cool environment (65 to 70 F.) is of importance in the therapy of burns and burn shock, whether hyperpyrexia is present or not. If extremely high body temperatures are also a factor, as in the case described here, a cool environment becomes a critical necessity, the exact room temperature depending upon the individual requirements.

Our own observations, which include 2 other cases of severe resistant hyperpyrexia, one that of a 30 year old man with pneumococcic meningitis and the second that of a 6 year old girl with bulbar poliomyelitis, show that human body temperatures can be easily and quickly reduced from high peaks of 106 F. to 98 F. and maintained near the normal level by use of a cold room similar to that described. The total cost of constructing such a room was $1,200 (in 1946).

The importance of controlled environmental temperatures in tropical and subtropical areas is obvious. It is equally evident that the usefulness of a cold room extends to temperature zones under certain conditions. Because of the nature of military operations, this type of room would be of definite usefulness to military medical facilities in all zones. It would be particularly important to have such equipment in hospital ships and hospital transports and in air craft carriers, because of the frequency of severe burns in naval warfare and the difficulty of cooling wards and sick bays in naval vessels operating in tropical waters.

Summary

1. Interference with the ability of the human body to lose heat will result in hyperpyrexia, which may be fatal unless effectively treated. Such a situation was present in the case of a patient with 50 per cent of his skin area burned and with pressure bandages over 85 per cent of his total surface area.

2. The extreme elevation of body temperature in the case described

4. Elman, R.; Cox, W. M., Jr.; Lischer, C., and Mueller, A. J.: Proc. Soc. Exper. Biol. & Med. 51:350,1942.
5. Rosenthal, S. M.: Pub. Health Reports 57:1923, 1942.
6. Sellers, E. A., and Willard, M. A.: Canad. M. A. J. 49:461, 1943.
7. Allen, F. M.; Crossman, L. W., and Safford, F. K., Jr.: New York State J. M. 53:951, 1943.
8. Bergman, H. C., and Prinzmetal, M.: Arch. Surg. 50:201, 1945.

was easily and quickly lowered to normal range and then maintained at levels below 101 F. by placing the patient in a cold room, which is described.

3. The value of a controlled environmental chamber is shown, with especial reference to its use in tropical and subtropical zones. The usefulness of such a room to both military and civilian hospital facilities is noted.

We desire to express our appreciation to Prof. William S. McCann for his helpful suggestions in the conduct of the work and preparation of the manuscript.

We also wish to thank the surgical department and Bradford Simmons, M.D., for their cooperation in making possible the observations in this case.

THERAPEUTIC DEVICES UNDER THE FEDERAL FOOD, DRUG AND COSMETIC ACT *

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Therapeutic devices came under federal control for the first time with the passage of the Federal Food, Drug and Cosmetic Act, June 25, 1938. By this statute the responsibility for the interstate distribution of such devices under labeling which would insure safe and efficacious use was clearly placed on the manufacturers and distributors of such apparatus.

The term "device" as defined in the Act means instruments, apparatus and contrivances, including their component parts and accessories, intended for use in the diagnosis, cure, mitigation, treatment or prevention of disease in man or other animals or intended to affect the structure or any function of the body of man or other animals.

The labeling provisions for devices parallel generally those for drugs Misbranding arises when the labeling is false or misleading in any particular or if the device is in package form and the label fails to bear conspicuously the name and address of the manufacturer, packer or distributor and an accurate statement of the quantity of contents. The labeling is required to provide in addition adequate directions for use and adequate warnings against misuse. If it is dangerous to health when used as recommended in its labeling, it is misbranded. A device is classed as adulterated if its strength differs from the purity or quality which it is purported or represented to possess. This may seem strange when applied to machines or apparatus, but this section of the Act is the one invoked when the Administration encounters clinical thermometers which fail to record accurately or prophylactics which have holes. The Act demands a high level of responsibility, and most manufacturers have accepted and carried out their obligations. Unfortunately, there are numerous devices on the market which require constant surveillance.

Effective enforcement of this statute depends in a large measure on the cooperation received from professional groups. In the field of devices those intimately affiliated with their use can be of the most assistance. Since most therapeutic devices are employed by physicians trained in the field of physical medicine, it is quite necessary that the support and guidance of experts in

* Read at the Twenty-Sixth Annual Session of the American Congress of Physical Medicine, Washington, D. C., Sept. 8, 1948.

this special field be enlisted. To this end the American Congress of Physical Medicine has set up a committee to cooperate with the Food and Drug Administration. Through this public-spirited group a wider interest can be developed in our mutual efforts to protect the public from misbranded devices by obtaining the consensus of medical experts with respect to the truthfulness and adequacy of labelings for devices, as well as assisting in the solution of some of the many problems arising in that connection. It is anticipated that this arrangement will bring about a free exchange of technical information beneficial to both groups, which are concerned equally with the health and welfare of the public.

It should be recognized that there is a wide variety of devices for which therapeutic claims are made. They range from such fraudulent apparatus as a colored light gadget consisting of a 1,000 watt bulb in an impressive metal cabinet on one extreme to short wave diathermy for home use on the other. Unfortunately, there have been a number of worthless gadgets sold to the public which constitute a real problem. The physical properties of such units as well as their clinical application must be carefully evaluated. There is another group of devices which possess physical properties that can be employed by the public if adequate directions and warnings against misuse are supplied in those conditions in which they have recognized benefits. Too often the manufacturer fails to limit the therapeutic representations to the extent essential to avoid misleading the user. In the case of therapeutic devices sold directly to physicians, the unit is very often submitted to the American Medical Association's Council on Physical Medicine for acceptance. In these instances scientific data are made available to enable an evaluation of the apparatus.

It is the wholly worthless and the potentially useful devices for general sale that require close supervision and professional scrutiny to determine whether they are labeled in compliance with the requirements of the Act. In addition, certain devices are recognized to be useful and safe only under medical supervision, yet unscrupulous or misguided manufacturers occasionally introduce such devices for lay distribution.

The violations encountered in the device field are of a serious character. Unprincipled adventurers in the business of furnishing cure-all therapeutic gadgets are rampant. They victimize people who can ill afford the excessive prices of these contraptions. It has seemed that the persistence of these offenders is directly proportional to the increasing absurdity of the claims they make for their contraptions. Even more tragic is the fact that persons turn to these fraudulent pieces of equipment for the treatment of serious diseases which require immediate, competent diagnosis and rational treatment by a physician.

The range of diagnostic and therapeutic devices which are actionable can best be exemplified by reference to a few which have been the bases of actions. A vapor bath system, consisting of certain nonvolatile drugs and plumbing connections between a generator and bath cabinets, which could be purchased for $2,200 was represented recklessly as effective for diabetes, abscess of the lungs, decay of the jawbones and blood poisoning, among a long list of other ailments.

A device for administering an enema, priced at $1,190 was offered for the treatment of arthritis, rheumatism, neuritis, high and low blood pressure, toxic heart conditions, ulcers of the stomach and bowels, colitis, chronic appendictis, gallbladder and liver troubles, lumbago and, for good measure, "a host of ills that heretofore have been obscure."

Chlorine-generating devices have been seized because of claims for effective treatment of sinusitis, arthritis, hay fever, bronchitis, and common colds. Chlorine gas is given off by electrolysis. In an action against the chlorine-generating device "Cloro," a court contest resulted in a directed verdict for the government, and on Feb. 5, 1947 the device was ordered to be destroyed. Subsequently an information was filed, and the manufacturer entered a plea of nolo contendere to the charge of shipping this device misbranded with false and misleading therapeutic claims in accompanying circulars. He was placed on probation, and sentence was suspended for six months.

Another flagrantly misbranded device, called "Spectro-Chrome," is a 1,000 watt lamp in a cabinet supplied with different-colored glasses to fit an aperture through which the light bathes the patient. With head pointing toward the north, the patient received "tonations" at favorable times of the day, with a "Favorscope" supplied to correct for "solar, lunar terrestial radiant and gravitational influences" based on "vibrant breath phenomena" as adapted from Yoga. It was claimed that, by using appropriate glasses to color the light as required for the particular areas of the body to be treated, the patient could receive effective treatment for diabetes, cancer, tuberculosis, syphilis and a long list of other serious ailments. Dinshah P. Ghadiali, who manufactured the apparatus and who scorns the use of drugs, said: "Give me a case of appendicitis, and I will send the man back in one night, having his appendix inside of him instead of in a glass bottle and $300 out."

This lamp, more marvelous than Aladdin's, was not for sale. To get it one had to join an "Institute" for a fee of $90. The lamp was then furnished free. Through this scheme we know that at least 5,000 lamps were distributed. Ghadiali himself claimed the figure was 9,000. With the gadget, for a price, were distributed so-called encyclopedias and other literature which gave voluminous information about the use of the lamp and sought to cloak the scheme in oriental mysticism and sanctity.

The first action against the lamp was a single seizure. After a trial which lasted thirty days, the jury rendered a verdict for the goverment. The court was so incensed at the abuse of public welfare that he supplemented the decree condemning the lamp with an injunction against its further distribution. Ghadiali, nevertheless, continued to ship it. A campaign of seizures followed which did not stop him. Criminal prosecution was then filed against Ghadiali and his corporation. During this trial, which lasted forty-two days, the government presented an array of physicians and relatives of victims who had used the device and died from the diseases it was represented to cure. Speaking from the witness stand, the son of a man who had died from diabetes while being treated with the device said to Ghadiali: "You told my father to stop insulin! You said for him to eat plenty of brown sugar and starches! You said he would recover with Spectro-Chrome!" The jury brought in a verdict of guilty, and the court imposed against Ghadiali and his corporation fines totaling $20,000 and a three year prison sentence against Ghadiali, but imprisonment was suspended on the condition that the business be stopped. Sentence was deferred on four of the counts against Ghadiali upon the same conditions, so that if he resumes business he faces the possibility of a prison sentence of seven years and an additional fine. This decision was appealed by Ghadiali and was reviewed by the Third Circuit Court of Appeals in February, 1948. The District Court's conviction was affirmed. He forwarded a 98 page petition to the Supreme Court requesting certiorari, which was denied.

Another apparatus, known as "Cosmo-Light," relied on light and color for its "highly efficacious healing" effects in the treatment of poliomyelitis, sprained wrist, bladder trouble, prostate ailments, colitis, lung trouble, blindness, arthritis, asthma, among other serious diseases. This device consisting of two parts, a box with six tubes supplying violet, green, rose, gold, white and yellow lights similar to those seen in neon signs and a hand applicator with two tubes to be used for massage over the area to be treated as well as over the liver "no matter what is wrong" was claimed to manufacture "Tritonic ozygen." The instructions recommended elevating the patient so that he could see the "healing" colors while being treated. The device was seized and the manufacturer prosecuted for perpetrating this grossly misbranded gadget.

It may be helpful in consideration of the activities of the Food and Drug Administration to recognize that this federal organization is a relatively small one whose personnel numbers slightly more than a thousand. The annual appropriation to cover enforcement operations involving foods, drugs, cosmetics and devices is around 4½ million dollars, roughly three cents per year for each person in the United States, a very small amount, to be certain, for the extensive protection to be provided by this Administration.

In the presentation of court actions involving therapeutic devices, the government relies upon the assistance of outstanding and recognized experts in physical medicine to explain to the court and jury the medical basis for the charges from the physiatrist's point of view. It cannot be stressed too forcefully that it is only with the full cooperation of the experts in physical medicine that the Food and Drug Administration is able to present effectively the necessary facts and evidence in order to bring about appropriate corrections in the labelings of the various classes of devices in the interest of the public welfare. It should be recognized that through the regulatory activities of the Food and Drug Administration the field of physical medicine can be rid of some of the charlatans and their worthless gadgets. Furthermore, as various pieces of apparatus, whether of a scientific or pseudo scientific nature, are encountered and investigated by experts in the field of physical medicine it would be most helpful to have such information made available to the Administration.

It cannot be emphasized too strongly that the protection provided by the Act from adulterated and misbranded devices is an extension, far reaching and continuing task. The American Congress of Physical Medicine can continue to make a valuable contribution in their interest to protect public health and promote public welfare by supplying this Administration with the aid and support which it requires in carrying out the regulatory provisions of the Act.

Discussion

Howard A. Carter (Chicago): Although the word "device" is not specifically mentioned in the title "Federal Food, Drug and Cosmetic Act" of June 25, 1938, the therapeutic device is mentioned in the text of the act and is considered as if it were a "drug." Before this act was passed, the Food and Drug Administration did not have sufficient power to criticize and regulate the labels on quack devices, and hence the Act significantly strengthened the hand of the Administration.

Much good work has been done by the Administration charged with the responsibility of carrying out the letter and spirit of the statute, but the wheels of justice grind slowly. The Administration is obliged to have an abundance of evidence before it can take any action. Thus, many months may slip by before a proponent of a quack device can be called to justice.

Physicians and technicians in this audience can be of great service to the Administration by serving as investigators and by informing the Administration about a questionable appliance which has appeared on the market. Furthermore, the physician interested in physical medicine

can also be of service by offering assistance in the investigation of such equipment.

It is interesting to note the relationship in principle of the Food and Drug Administration and the Council on Physical Medicine. Both agencies are judicial in scope and both investigate and report on therapeutic products.

The Council on Physical Medicine is primarily interested in new methods and devices recommended for therapeutic purposes which are sold to the medical profession. The Food and Drug Administration not only is interested in foods and drugs and devices sold to the physician but directs its attention (and rightly so) to products which are sold to the public. Before the Federal Food, Drug and Cosmetic Act of 1938 was passed, the Council on Physical Medicine investigated and reported on many questionable pieces of apparatus recommended for therapeutic purposes. Many of those devices were advertised and sold to the public. Since the passage of the act, the Council has been relieved of this work and has been able to devote itself more profitably to the investigation of products which are promoted for the attention of the physician.

The medical profession should be grateful that the Food and Drug Administration is doing this excellent and necessary work.

PROGRESS REPORT

Physical Medicine in Latin America

By S. Arana-Soto, M.S., M.D.,

San Juan, Puerto Rico.

After the enormous development of physical medicine in the United States, where a board for the qualification of specialists has recently been established, where thousands of hospitals now have departments in the specialty and where millions of dollars are spent in the training of doctors and technicians, it is interesting to know to what extent physical medicine is coming into its own in Latin America.

But it is not easy to obtain detailed information on the subject. I could not find any in Moll's "Aesculapius in Latin America," nor could he, as Secretary of the Pan-American Sanitary Bureau, give any help in the matter. There are twenty republics in Latin America, Haiti, of French origin, and Brazil, of Portuguese origin, being the only ones which are not of Spanish descent. Santo Domingo is an island with one million inhabitants; Mexico and Argentina are very large countries with populations of from 10 to 20 millions; Brazil, with its 50 million population, occupies an area larger than that of the United States. This is to show how varied are these countries as to size, wealth, population and development, and how dissimilar they must be in regard to the organized employment of physial medicine. If I dare, then, to write on this subject it is because I shall not enter into any details. Most of my information comes from my own general knowledge of Latin America, my personal relations in the different countries, familiarity with the language and with literature on physical medicine, and, in this last respect, from my work as assistant editor of the *Journal of Occupational Therapy and Rehabilitation*. I am indebted to Dr. Quintero da Fossas, of Cuba, and Dr. Mezzadra and Professor Nájera, of Buenos Aires, for their help.

When I say physical medicine I refer, of course, to that branch of medicine, and specially of therapeutics, which has recently been organized as a specialty in the United States. I am not employing the term in its more comprehensive aspect, for it would then include, among others, radiology and radium therapy.

In Latin America, up to the second World War, physical medicine, as well as medicine in general, was very much under the influence of Europe: technics, general ideas and literature were borrowed from the old continent. In these last years we have witnessed a change toward the United States. American influence has been steadily increasing; American literature, ideas, technics and equipment find more and more favor, and an increasing number of doctors come north for training in the specialty. While I was pursuing my studies in Chicago a few years ago I met several Latin American colleagues who were taking courses — usually short courses — in physical medicine. But even now the terminology used is quite foreign to American medical men; such words as kinesitherapy, kinephylaxis, seismotherapy, massotherapy, kinesiology, etc., are in common use, making it rather difficult at times for us to understand Latin American papers.

As far as I know, there exists south of the Rio Grande no board or scientific or professional association of specialists in physical medicine. Teaching of this branch

(*Continued on page 109*)

ARCHIVES of PHYSICAL MEDICINE

OFFICIAL PUBLICATION AMERICAN CONGRESS OF PHYSICAL MEDICINE

.·. EDITORIALS .·.

AMERICAN BOARD OF PHYSICAL MEDICINE

The next examinations for the American Board of Physical Medicine will probably be held in Philadelphia, June 4 and 5, 1949. The Board has previously announced that these examinations would be held in Atlantic City. If you are a prospective candidate for these examinations, please keep in touch with the Secretary who will be able to make a definite announcement of the city in the very near future. The final date for filing application is March 15, 1949. The Secretary is Dr. Robert L. Bennett, Georgia Warm Springs Foundation, Warm Springs, Georgia.

PHYSICAL MEDICINE AND REHABILITATION

The application of physical procedures in diagnosis or treatment of patients who are acutely ill or who are chronically disabled has come to occupy an important place in the modern practice of medicine. Expansion of the whole field has been so rapid that occasional changes in terminology, which indicate this expansion, have been necessary. In 1944 when it became apparent that our growing specialty should include the employment of physical agents not only for therapy but also for diagnosis and when it became apparent that occupational therapy should likewise be included, the Council on Physical Medicine recommended that its name should be changed from "The Council on Physical Therapy" to its present name. The Board of Trustees of the American Medical Association promptly approved of this change in name and since 1945 the Council has been known as "The Council on Physical Medicine." Our congress and the society of medical specialists in the field promptly followed suit and changed their names respectively to "The American Congress of Physical Medicine" and "The Society of Physical Medicine."

During World War II and in this postwar period, the close relationship between physical medicine and the rapidly growing field of rehabilitation have become increasingly apparent. In our governmental hospitals and, to an ever-increasing extent, in our civilian institutions, the services in physical medicine and rehabilitation have become inextricably conjoined. In the Army after World War II there was established a Physical Medicine-Consultants Division which directs the activities not only in physical medicine but also in rehabilitation and physical reconditioning in all Army general hospitals. In the Veterans Administration a Physical Medicine Rehabilitation Service has been established which co-ordinates and directs the work in physical medicine and rehabilitation in all the hospitals of the Veterans Administration. In our civilian teaching institutions, combined residencies in physical medicine and rehabilitation are being offered in rapidly increasing numbers.

The Council on Physical Medicine and representatives of the Council on Medical Education and Hospitals of the American Medical Association have agreed that the fields of physical medicine and rehabilitation are so closely related that it would be inadvisable to offer separate residencies or fellowships in these

two branches of medical practice. A movement toward the development of more combined residencies in physical medicine and rehabilitation should be encouraged. Those who direct existing approved residencies in physical medicine should be urged to include more complete instruction in rehabilitation. Furthermore, separate residencies in rehabilitation, without adequate representation of physical medicine, should not be offered. It is apparent also that specialists in other fields might obtain a better knowledge of the newer concepts and basic philosophy of physical medicine and rehabilitation if the specialty boards in such fields as internal medicine, neurology and orthopedics would give credit, for a period of training up to one year in length, in physical medicine and rehabilitation.

It is obvious that the close relationships between physical medicine and rehabilitation must be recognized. While neither special field can or should absorb the other, the many interconnections should be indicated. There are phases of physical medicine (as in the definitive treatment of acute diseases by physical agents) which cannot be called rehabilitation. Similarly there are phases of rehabilitation (as in the psychosocial readjustment of disabled persons) which cannot be called physical medicine. Yet, for the most part, physical medicine and medical rehabilitation are closely interdigitated and it is apparent that it would be illogical for either physical medicine or medical rehabilitation to go its separate way.

Because of these facts and because the work of the Council on Physical Medicine has become more and more involved with the various aspects of rehabilitation as well as with many phases of physical medicine a new name for the Council seemed desirable. Accordingly at its annual meeting in December, 1948, the Council recommended to the Board of Trustees of the American Medical Association that its name be changed from "The Council on Physical Medicine" to "The Council on Physical Medicine and Rehabilitation." The members of the Council pointed out that there are other special fields of medicine in which a similar joint terminology has been found essential. These include "dermatology and syphilology," "obstetrics and gynecology," and "psychiatry and neurology."

Because the fields of physical medicine and rehabilitation will always be closely interrelated but can never be fully amalgamated, the members of the Council concluded that it was wholly logical and, in fact, highly desirable to employ the name "Physical Medicine and Rehabilitation," which would indicate more specifically the present status of this growing branch of medical activity.

It is believed that all of the medical specialists in our field will agree that it was greatly to our advantage when we followed the lead of the Council on Physical Medicine in dropping the designation "physical therapy" and substituting the more inclusive and more generic term "physical medicine." Perhaps our Congress and our Society should begin to consider the advisability of following the lead of the Council once more and if the Board of Trustees of the American Medical Association does approve the Council's new recommendation, take under advisement the adoption of this new term "Physical Medicine and Rehabilitation" for describing our expanding field of medical activity.

PHYSICAL MEDICINE AT THE AMERICAN MEDICAL ASSOCIATION

Physical medicine will be represented extensively once again during the annual sessions of the American Medical Association at Atlantic City from June 6 to June 10. Once more there will be a Special Exhibit on Physical Medicine and Rehabilitation among the scientific exhibits and this year the Special Exhibit will be sponsored by the Baruch Committee on Physical Medicine. This year there will be two Sessions on Physical Medicine instead of

one and according to present plans, these sessions will be held in the Ocean Room at the Marlborough-Blenheim Hotel on Wednesday morning, June 8 and Thursday morning, June 9. It is important that those of us who are interested in physical medicine give full support to these sessions and members of the Congress are urged to make their hotel reservations early and to mark the time and location on their calendars and make plans to attend this important meeting.

Progress Report

(*Continued from page 106*)

of medicine is usually limited to a few lectures and demonstrations in the largest medical schools. Physical therapy is usually taught as part of radiology. As a matter of fact, when information was sought on the subject, all correspondents gave information preeminently on radiology—societies, journals, etc. This is due to the fact that radiology came into existence as a specialty earlier than physical medicine, and the first organized physical therapy was taught and practiced in Europe as part of, or associated with, radiology.

The teaching of technicians is done in Argentina in the School of Kinesiology of the Faculty of Medical Sciences of Buenos Aires. This school has existed since 1937, when it was founded by Prof. Palacios Costa. From 1938 on Dr. Octovio C. Fernández was its director. It is now under the direction of Prof. Dr. Juan M. Nájera. At the end of 1947 it had 29 first-year students, 22 in the second year and 15 in the third and last year. "Kinesiology is the study of movement applied to the human body with a therapeutic or phylactic purpose." To study kinesiology, to be a kinesiologist, the school has the same admission requirements as the Medical School, and the course lasts three years. In the report of its director for the year 1947, it is said that "in anatomy, for the first time, students practiced dissection." Without entering into any details, it may be said in conclusion, that the course is very good and complete but that it teaches kinesiology and not physical therapy. As far as I know, similar courses are given also in Mexico and Chile. In the latter country, as in Argentina, there is an Association of Kinesiologists. But, their training is limited to kinesitherapy, and they are called kinesitherapy technicians. The course lasts ten months but the candidate must have a four-year course in physical education. The *Review of Physical Education* is the only journal devoted, at least in part, to kinesitherapy.

The best hospitals, specially in Argentina and Mexico, whether public or private, have departments of radiology and physical therapy, in which the latter is of course, the less important. In Buenos Aires, for example, there is a Municipal Institute of Radiology and Physical Therapy, besides the one in the clinical hospital associated with the Faculty of Medical Sciences.

It is evident that physical therapy is in no way organized in the American fashion. It is prescribed and given in the department of radiology and physical therapy; the technician is at best only a kinesiologist, and the director is usually a very good medical man — and even a very good specialist — but a man who has not had a prolonged training and has not taken a board examination or belongs to any professional or highly specialized group of men. In the words of Professor Nájera, "the situation is more or less similar in all Latin America that we know, and the tendency is for the nonmedical semiprofessionals, such as the teachers of physical education, to invade this field of activity."

In private practice, physical therapy is ministered to by the general practitioner. I have the impression that in many countries there is a taste on his part for complicated or impressive apparatus or the tendency to cater to such a taste in the patient. According to my information, there are no large numbers of osteopaths, chiropractors or members of other organized cults, but, rather, there are many independent nonprofessional or semiprofessional people who do not answer to any special description.

There is only one medical journal dedicated to physical medicine, or rather to one of its branches, the *Argentine Archives of Kinesiology*, which first appeared in November, 1947. It is the official organ of the "Ateneo" of the School of Kinesiology of the Buenos Aires Faculty of Medical Sciences. The "Ateneo," founded according to the provisions of the University Act gives courses in subjects not included in the regular curriculum of the school and seminars. Its aim is the diffusion of knowledge in the special field; it is a free "tribune" from which eminent men may present their work and ideas. Papers on different aspects of physical medicine appear in medical journals, specially in those devoted to radiology, and, of course, aspects of the subject are often discussed in

papers about industrial medicine. In this respect must be mentioned the Journal *Medicina del Trabajo y del Deporte* (Work Sports Medicine), of Buenos Aires, where good papers on physical therapy often appear. But most papers deal only with descriptive aspects of the technics of physical medicine, or clinical results obtained by its use, or the discussion of the ideas of European writers and research workers. There is very little research, and original work is quite scarce.

To sum up, we find that physical medicine in Latin America is not organized in the American way. Departments of physical medicine are sparsely disseminated in the large cities, hospitals and medical schools, and are still usually a part of, or are combined with, the department of radiology. There is no board or professional association of specialists. Teaching is usually limited to a few hours of lectures and demonstrations. Technicians are trained only in kinesiology in Buenos Aires (School of Kinesiology, Faculty of Medical Sciences) and in Chile and Mexico. Perhaps most of the practice is in the hands of nonprofessional, semiprofessional or irregular people. There is only one journal devoted to any branch of the specialty: *The Argentine Archives of Kinesiology*. The literature is lacking in original work; little research is being carried on. And although American influence is steadily increasing, the Old Continent still holds sway, particularly as regards ideas.

This does not mean that physical medicine does not have a bright future in Latin America. There is an increasing interest in the subject; more and more physicians are going abroad, specially to the United States, for training; there is an increasingly greater tendency to take the practice of physical medicine away from nonprofessionals and semiprofessionals. The School of Kinesiology of Buenos Aires will no doubt have a great influence in the matter, by training good kinesiologists and raising the requirements for admission to its study and raising the standards of technicians. More and more physical therapy departments will be established, specially as new modern hospitals are built everywhere, often to be devoted to industrial work. I imagine that the new industrial hospital in Lima, Peru, will have a good department of physical medicine. And in due time, I am sure that physical therapy will achieve independence from radiology, and will be taught and given in different hospital and university departments.

Some Latin American countries are very progressive, and there are men, especially in the large cities, who take those ideas to heart. It may be expected that in a short time, at least in such cities as Buenos Aires, physical medicine will progress by leaps and bounds. One has only to learn about the work of Professor Nájera, of Buenos Aires, to feel the enthusiasm with which he and his associates are given to their work. The *Argentine Archives of Kinesiology* will greatly contribute to the diffusion of these ideas in all Latin America and to the interchange of ideas and technics.

I have not mentioned Puerto Rico in this paper, because I have written elsewhere about the development of physical medicine in this small country, which is none the less a definite part of Latin America, in spite of its lack of political independence. It has been my good fortune to introduce organized physical medicine into my country, and this may be the best place to thank the Department of Physical Medicine of the Northwestern University Medical School, particularly Professors Coulter and Osborne, for their great help to me. The Physical Rehabilitation Clinic of the State Insurance Fund of Puerto Rico may be destined to be perhaps the outstanding physical medicine department in the United States. It was organized three years ago in the American way, with a trained specialist at its head, chief technicians in physical and occupational therapy and trained technicians, besides the necessary space, equipment and organization. It now treats an average of 150 patients a day. It has a department of occupational therapy with a chief technician and several registered technicians. We receive all journals in English which relate to the subject and are in contact with the world of physical medicine. We have, besides, in Puerto Rico, smaller departments of physical medicine in our large district hospitals, and Puerto Rican technicians have already organized their chapter of the American Physical Therapy Association. A committee on Physical Medicine and Rehabilitation has been established by the Puerto Rico Medical Association.

Puerto Rico, because of its geographical position, its language and its association with the United States could very well be the center for the diffusion of organized physical medicine in Latin America, and, also be a great center for research in physical medicine, especially in regard to the influence of tropical climate on the effects of physical agents or, in other words, the physiologic effect of physical agents in the tropics.

The treatment of tropical diseases by physical methods might also be a good subject for research. As far as I know, there is no such research center nor even any well organized department of physical medicine in any tropical country.

MEDICAL NEWS

New York Society of Physical Medicine

At its regular February meeting, the New York Society of Physical Medicine presented the following program: "Postural correction, therapeutic, prophylactic and cosmetic aspects," by Hans Kraus, M.D. The discussion was opened by Sonya E. Weber, D.Sc., (by invitation) and Elinor Fosdick Downs, M.D., (by invitation).

Pennsylvania Academy of Physical Medicine

The March, 1949, meeting of the Pennsylvania Academy of Physical Medicine will be held Saturday, March 12th at the Berkshire Hotel, Reading, Pennsylvania. An elaborate program has been planned to consist of full afternoon and evening sessions, dinner and a Sunday tour of the countryside. When final details of the program have been completed further announcement will be made by letter and through the journals.

A regular monthly meeting of the Pennsylvania Academy of Physical Medicine was held Jan. 20, 1949, at the Philadelphia General Hospital. Dr. P. S. Lucchesi, Medical Director and Superintendent of the Philadelphia General Hospital, spoke on the importance of rehabilitation in that hospital and Dr. Albert A. Martucci, Chief of Physical Medicine and Rehabilitation Division at Philadelphia General Hospital, spoke on orientation and management of rehabilitation centers. A series of cases was presented by Dr. Charles A. Furey, Jr., and Dr. Francis X. Sweeney, assisted by Mrs. Marie P. Craig, R. P. T. T., and Mr. Francis Nacelli, R. P. T. T. This was followed by a film demonstration of rehabilitation and a general discussion.

Department of Rehabilitation and Physical Medicine, New York University College of Medicine

Partial Schedule — Undergraduate Teaching Schedule 1948-1949

Third Year

Rehabilitation clinic on low back pains, Dr. Kraus, Staff, May 18, 11:30-1:00.

Rehabilitation and physical medicine in general practice, Dr. Covalt, May 25, 11:30-1.00.

The use of crutches and wheelchairs, Dr. Deaver, May 27, 4:00-5:00.

Fundamentals of therapeutic exercise, Dr. Kraus, June 1, 11:30-1:00.

Basic principles of physical therapy: Thermotherapy, Dr. Bilik, June 3, 4:00-5:00.

Basic principles of physicl therapy: Electrotherapy, Dr. Bilik, June 8, 4:00-5.00.

Basic principles of physical therapy: Hydrotherapy, Dr. Bilik, June 10, 11:30-1:00.

Fourth Year

The rehabilitation of the cerebral Palsied, Dr. Deaver, February 15.

The convalescence and rehabilitation of medical and surgical patients. I & K Amphitheatre, Bellevue Hospital, Dr. Rusk, February 21.

The management of decubiti and the bladder in paraplegic patients. Dr. Converse, Dr. Co Tui, Dr. Slaughter, I & K Amphitheatre, Bellevue Hospital, February 28.

The rehabilitation of the paraplegic patient, Dr. Deaver, March 1.

The rehabilitation of chronic Neurologic patients. Dr. Byer, March 8.

Rehabilitation in poliomyelitis. Dr. Deaver, March 15.

Rehabilitation in heart disease. Dr. Rusk, Dr. Rinzler, March 22.

Rehabilitation of the deaf and hard of hearing. Dr. Daly, March 29.

Rehabilitation of patients with upper extremity disabilities. Dr. Deaver, Mr. Daniel, April 5.

Rehabilitation of patients with lower extremity disabilities. Dr. Covalt, Mr. Daniel, April 12.

Rehabilitation in tuberculosis. Dr. Covalt, April 19.

Rehabilitation in peripheral vascular disease Dr. Ross, Dr. Rusk, April 26.

Rehabilitation in compensation medicine. Dr. Rusk, Dr. Weeden, May 3.

Rehabilitation in chronic disease. Dr. Rusk May 10.

Symposium On Physical Medicine

A symposium on physical medicine was given recently by Columbia University and was directed toward general physicians and general surgeons who encounter in their daily practice diseased conditions particularly amenable to treatment by methods of physical medicine. While physical medicine was emphasized, frequent references were made to medical and surgical principles to which these methods were fundamentally bound. Among the general subjects presented were: Arthritis, hemiplegia, peripheral nerve injuries, scoliosis (organic and functional), cerebral palsy, poliomyelitis, peripheral vascular diseases, fractures, somatic pain and rehabilitation. Particular emphasis was laid on physiologic indications and technics and the many important modalities used in physical medicine.

Training Courses in Poliomyelitis

Georgia Warm Springs Foundation. — Warm Springs Foundation announces graduate courses in physical and occupational therapy in the care of poliomyelitis. Divided into two parts, the courses cover the over-all care of convalescent polio and training in functional retraining. Each part lasts three months. The entrance dates are the first Monday in April, July and October. For complete information write to Dr. Robert L. Bennett, Georgia Warm Springs Foundation, Warm Springs, Georgia.

City Hospital, Department of Contagious Diseases, Cleveland. — Announcement is made of short training courses in poliomyelitis to be given this year at the Department of Contagious Diseases, City Hospital, Cleveland, under the direction of Dr. John A. Toomey. The dates of the courses for physicians are as follows:

July 18 — July 23, inclusive.

August 8 August 13, inclusive.

August 29 — September 3, inclusive.

These courses have been aided by a grant given by The National Foundation for Infantile Paralysis to Western Reserve University. The Foundation will pay the expenses of the enrollee, providing the chairman of his local chapter approves. Meals may be purchased at the hospital at a nominal cost, but each enrollee is responsible for his own hotel reservations. There is no tuition fee.

There will also be courses for nurses and physical therapy technicians. For complete programs and application blanks, write to Dr. John A. Toomey, City Hospital, Cleveland, Ohio.

Advanced Course Offered Physical Therapists

Announcement has been made of a special advanced course in rehabilitation methods for physical therapists to be conducted by the Institute of Rehabilitation and Physical Medicine of the New York University-Bellevue Medical Center in conjunction with New York University School of Education. The course, which will consist of didactic and clinical instruction in testing and advanced training in the activities of daily living and the practical problems of ambulation, elevation and self-care, will be conducted at the Institute with undergraduate or postgraduate credit given through New York University School of Education.

Instruction will be given under the supervision of Dr. Howard A. Rusk, Dr. George G. Deaver and Dr. Donald A. Covalt, all of New York University College of Medicine, and Miss Edith Buchwald and Miss Beth Addoms of New York University School of Education. The first of the series of courses will run from February 9th to March 22nd and April 4th to May 13th, 1949. Further information concerning the courses can be obtained by writing to Miss Edith Buchwald, Director of Rehabilitation Courses for Physical Therapists, Institute of Rehabilitaton and Physical Medicine, 324 East 38th Street, New York 16, New York.

The Hottest Place in North America

A study prepared for presentation to the American Meteorological Society by Arnold Court, meteorologist in the Office of the Quartermaster General in Washington, shows that the hottest place on the North American continent is the surface of the ground in Death Valley in Southeastern California during the month of July. On the basis of averages covering a period of thirty-six years, a maximum temperature of 180 F. may be expected on the desert floor on one day every seven years, while at 5 feet above the ground, where official temperatures are recorded, the reading would be 125 F. Weather observations in Death Valley were begun April 30, 1891, when a temporary weather bureau station was set up on Furnace Creek.

Army to Resume Course for Physical Therapists

The Surgeon General, Department of the Army, announces the resumption of the 12 months training course in physical therapy formerly conducted by the Medical Department. The first six months of this course, starting on November 1, will be conducted at the Medical Field Service School, Brooke Army Medical Center, Fort Sam Houston, Texas and will consist primarily of didactic instruction. During the second six months the students will be assigned to selected army general hospitals where the didactic instruction will be continued and correlated with clinical application.

A prerequisite for this course is completion of the 2 months' Basic Medical Department Female Officers' Course which is being given during September and October at the Medical Field Service School and which is designed to orient the individual to military customs, regulations and procedures.

Individuals applying for this training, in addition to being college graduates with major emphasis on physical education, must be physically qualified, female citizens of the United States, not over 26 years of age, and must be in an unmarried status with no dependents under 14 years of age. Only persons who have signed a statement expressing a desire to enter the Regular Army will be considered for this training.

Qualified applicants must apply for and accept a commission as a second lieutenant in the Women's Medical Specialist Corps Reserve and request extended active duty for a period of not less than two years. Students selected for this training will be furnished government quarters and will receive approximately $200 a month.

Upon the satisfactory completion of the physical therapy training course these officers will be assigned as physical therapists in army general hospitals. After serving in such assignment for not less than 6 months., these officers will be expected to apply for commissions in the Regular Army.

The date of the next course has not been determined but it is anticipated that it will be repeated in 1949. Further information regarding this training may be obtained by writing to The Office of The Surgeon General, Department of the Army, The Pentagon, Washington 25, D. C., Attention, Chief, Physical Therapist Section, Women's Medical Specialist Corps.

Research on Poliomyelitis

The National Foundation for Infantile Paralysis has awarded a research grant of $6,080 to the University of Illinois College of Medicine for the period from July 1 to December 31. The grant will be used for electromyographic studies and studies in electrical stimulation of muscles of patients with poliomyelitis. The studies will be carried out by Dr. Andrew C. Ivy, Vice-President in charge of the Chicago Professional Colleges, and Dr. H. Worley Kendell, head of the department of physical medicine.

Medical Advisory Committee for Armed Forces

The members of the committee are:

Dr. Raymond B. Allen, Seattle, President of the University of Washington.

Dr. Edward D. Churchill, Boston, Professor of Surgery, Harvard Medical School, and formerly President of the American College of Surgeons.

Dr. Michael DeBakey, Professor of Surgery, Baylor Medical College, Houston, Texas.

Dr. Paul R. Hawley, Chicago, formerly Chief Medical Director, Veterans Administration.

Dr. Richard D. Meiling, Assistant Professor of Obstetrics and Gynecology, School of Medicine, Ohio State University, Columbus, Ohio.

Dr. Maurice C. Pincoffs, Professor of Medicine, University of Maryland, Baltimore.

Dr. Howard A. Rusk, Professor and Chairman of the Department of Rehabilitation and Physical Medicine, New York University College of Medicine, and Medical Editor, *New York Times*.

Dr. Walter H. Scherer, Houston, Texas, Past President, American Dental Association.

Dr. Paul Titus, Pittsburgh, Secretary-Treasurer and Director American Board of Obstetrics and Gynecology.

Maj. Gen. Raymond W. Bliss, M.C., U.S.A., Surgeon General of the Army.

Rear Admiral Clifford A. Swanson, M.C., U.S.N., Surgeon General of the Navy and Chief of the Bureau of Medicine and Surgery.

Maj. Gen. Malcolm C. Grow, M.C., U.S.A., The Air Surgeon.

Quadruple Amputees

The nation's two quadruple amputees of World War II are well along to become self-supporting citizens, one as a lawyer and the other as a farmer, with the help of benefits administered by Veterans Administration.

James Wilson of Jacksonville, Florida, radio operator who lost both legs and arms in a war time airplane crash, began his third year as a pre-law student at the University of Florida in Gainesville under the Vocational Rehabilitation Act (Public Law 16).

Frederick Hensel, Birmingham, Alabama, whose arms and legs were blown off by a Japanese shell on Okinawa, is taking institutional on-farm training under Public Law 16 on his own farm, purchased with funds donated by citizens of Chicago, Illinois.

Wilson, on duty in a B-24 which crashed in October, 1944, near Burlington, Vermont, had trouble at first learning to walk with artificial legs. Months passed before he was able to use crutches or canes, for his artificial hands were unable to grasp them firmly.

Now, he shaves, dresses himself, drives a car and operates an electric typewriter. VA provided the car, equipped with special hand attachments for gas and brakes, and the typewriter, on which he takes examination and prepares assignments.

Hensel started training under Public Law 16 more than two years ago on his farm, located between Mt. Pinson and Birmingham, Alabama. He had no previous experience at farming.

VA provided him with a tractor under its "conveyances for amputees" program, and the Ford Motor Company, where he was employed before the war, gave him a new car equipped with hand controls.

Rebates

The House of Delegates of the American Medical Association has taken a definite stand against the acceptance by physicians of rebates or "kick-backs" in any form. A physician dispenses medical or surgical service and for this he is entitled to a fair recompense. When he, himself, furnishes drugs, spectacles or any physical appliance and when is able to service such physical appliances, he is entitled to a fair profit on these articles of merchandise in addition to and above his own professional fee and such a profit on such articles of merchandise does not in any way constitute a rebate or "kick-back." However, when he prescribes such an article for his patient and the patient purchases the article from an independent dealer the doctor is not morally or ethically entitled to any financial return from the dealer.

It has come to the attention of the Consultants on Audiometers and Hearing Aids of the Council on Physical Medicine of the American Medical Association that physicians in various parts of the country are being offered, and that some have accepted, money from dealers for recommending particular makes of hearing aids. Such a transaction between the doctor and the dispensor of hearing aids constitutes a rebate and is in direct contravention of the stand of the American Medical Association in this matter. It is degrading to the profession and commercializes the doctor who accepts such a "kick-back." It is not believed by the Council on Physical Medicine that such a

policy is encouraged by the manufacturers of hearing aids, but the manufacturer cannot always control the business ethics of his individual dealers.

A modified form of "kick-back" is a recent suggestion that a hearing aid dealer would sell only to patients whose ears had been examined by an otologist. The doctor's fee according to this arrangement would be paid by the hearing aid dealer. Presumably the cost would be passed on ultimately to the patient in the form of a higher price for his instrument. Such an arrangement is disapproved by the Consultants, since it involves a payment from dealer to physician that might be interpreted or used as a "kick-back." To be beyond criticism in such a situation, the payment to the doctor should be made by the patient himself, not by the dealer.

The Council on Physical Medicine believes that these practices constitute the acceptance of a rebate on the part of the profession and that every possible step should be taken to abate it.

Special Exhibit on Physical Medicine

In its report to the House of Delegates of the American Medical Association, the Bureau of Exhibits stated: "The Special Exhibit on Physical Medicine, shown for the third time with Dr. Frank H. Krusen, Rochester, Minn., as chairman, not only had a spectacular appeal, but included the practical information necessary for the physician in general practice. The constant throng surrounding the eight booths in the exhibit was an indication of the desire on the part of physicians for more knowledge on the subject."

Exercise Films Available

Announcement has been made by the Institute of Rehabilitation and Physical Medicine of New York University-Bellevue Medical Center of the release of the first three of the series of teaching film strips which will include Body Exercises, Mat Exercises, Wheelchair Exercises and Technics, Elevation and Ambulation Technics, Crutch Walking and Functional Retraining in the Activities of Daily Living.

The first three of the series which are now available include: I. Crutch Exercises showing in detailed sequence through photographs, animation and text exercises against and away from the wall for the establishment of balance and the skills necessary for later crutch walking. II. Crutch Walking: The Four Gaits showing in detailed sequence through photographs, animation and text the methods of walking with the "Four Point Gait" and "Four Point Alternate Gait." III. Crutch Walking: The Tripod Gaits showing in detailed sequence through photographs, animation and text the methods of walking with the "Shuffle to Gait," "Swing to Gait" and "Swing Through Gait."

The strips are being distributed by Filmstrips, Inc., 1307 Sixth Avenue, New York, N. Y.

Non-Tippable "Walker"

A non-tippable "walker," designed to help disabled patients in Veterans Administration hospitals learn to walk by building up their self-assurance, has been devised by two employees of the VA Center in Martinsburg, West Virginia

The VA employees, Willard I. Braithwaite, corrective therapist and Franklin J. Weller, manual arts therapy instructor, jointly received a $1,000 award from the VA Employees' Suggestion Committee for having perfected the apparatus.

The Braithwaite-Weller walker, a wide metal frame with adjustable arm-rests—is built so that a patient can maneuver his wheel chair into position and pull himself up to a walking position without help. Because of the twenty-three inch width of the device, the patient can throw his weight from side to side without fear of tipping.

By using the walker, he quickly becomes less dependent on his instructor.

Conventional walkers — narrower frames with fixed arm-rests — require instructors' full-time attention. Patients have to be lifted from wheel chairs to walkers and instructors have to be present at all times to prevent tipping. At the end of the walking period, patients then are lifted back into their chairs. Old-style walkers can be converted to the new with a maximum of three hours' shop work and $1.00 worth of materials. Conversion consists of widening cross-bars and rebuilding arm-rests.

Dr. Magnuson May Resign if Not Given Free Hand

Dr. Paul B. Magnuson, chief medical director of the Veterans Administration, has made it clear that he will resign rather than compromise principles of professional standards in operation of Veterans Administration's large medical and hospitalization program. On his return to Washington from a ten day inspection trip, he confirmed reports that pressure is being exerted within the Veterans Administration to effect certain changes, particularly in reference to location of hospitals. "There's likely to be a hell of a fight in the next few weeks to decide who's running this department," he declared. "I think I am," he added. Meanwhile, Dr. Magnuson announced establishment of the Veterans Administration's eleventh radioisotope diagnostic and treatment unit at the Nashville (Tenn.) Veterans Hospital. The newest facility for application of atomic medicine will be conducted in close cooperation with Vanderbilt University School of Medicine and the Nashville Deans Committee.

Electroencephalographs

There has recently been published by the Council on Physical Medicine of the American Medical Association the detail of the tentative minimum requirements for acceptable direct reading electroencephalographs.

Dr. Darling Coordinator of Program at Columbia

Columbia University on January 1 embarked on a new program of coordination and investigation of the widespread physical medicine program which has been developed under impetus from a grant of $400,000 from Bernard Baruch through the Baruch Committee on Physical Medicine.

President Dwight D. Eisenhower of Columbia announced that Dr. Robert C. Darling will serve as coordinator of the program. Dr. Darling is associate professor of medicine at the College of Physicians and Surgeons and chairman of the physical fitness subcommittee of the Baruch Committee. For the past three years, Dr. Darling has served as director of research in physical medicine at Columbia, a post he will retain. His new title will be coordinator of physical medicine and rehabilitation.

Dr. Willard C. Rappleye, dean of the Faculty of Medicine, explained that as a result of the Baruch grant, the University's physical medicine facilities have become so diverse and numerous that the need has arisen for a coordinator.

The new program will deal with the instructional and research activities in physical medicine at Columbia-Presbyterian Medical Center; the Institute for the Crippled and Disabled, which is affiliated with Columbia; the instructional program in physical and occupational therapy at the Medical Center and Teachers College and training projects for both technical and medical personnel at the Medical Center as well as eight other hospitals in New York City. The Institute for the Crippled and Disabled, created immediately after World War I, has became a leader in the field and was instrumental in training large numbers during and after World War II.

Apparatus Accepted

Press-Aire Pressure and Vacuum Pump — Manufacturer: Press-Aire Products, 909 E. Willetta, Phoenix, Arizona.

The Press-Aire Pressure and Vacuum Pump is a device designed to furnish relatively small positive or negative pressures such as might be used clinically for aerosol therapy. It can furnish a maximum air pressure of 15 pounds.

The Council on Physical Medicine voted to include the Press-Aire Pressure and Vacuum Pump in its list of accepted devices.

Life Lite Cold Quartz Ultraviolet — Manufacturer: Ultra Violet Products, Inc., 5205 Santa Monica Blvd., Los Angeles 27.

The Life Lite Cold Quartz Ultraviolet Lamp Model R-6 is of the high potential, low vapor pressure mercury arc type. It operates on 110 to 130 volts with average power consumption of about 35 watts. Exposures timed by automatic clock-controlled switch.

The Council on Physical Medicine voted to include the Life Lite Cold Quartz Ultraviolet Lamp Model R-6 in its list of accepted devices.

Microtone Audiomatic T-3 Hearing Aid — Manufacturer: The Microtone Company, 4602 Nicollet Avenue, Minneapolis 9.

The Council on Physical Medicine voted to include the Microtone Audiomatic T-3 Hearing Aid in its list of accepted devices.

New Department of Biophysics

Five scientists have been named to faculty posts in a new Johns Hopkins University department of biophysics, now called the Jenkins Department of the university in honor of the late Thomas C. Jenkins. Dr. Haldan K. Hartline, professor of biophysics and chairman of the new department, is a graduate of Johns Hopkins University, a former fellow of the National Research Council in medical sciences and from 1936 to 1940 and from 1942 to the present was on the faculty of the University of Pennsylvania. Others named are John P. Hervey, M.S., Martin G. Larrabee, Ph.D., Frank Brink, Jr., Ph.D., and Philip W. Davies. Dr. Larrabee and Mr. Davies are associate professors, and Dr. Brink and Mr. Hervey assistant professors. All of the new appointees are at the University of Pennsylvania, where they have been working with Dr. Bronk in biophysics. Dr. Bronk became president of Johns Hopkins University January 1.

Symposium on Physical Medicine at University of Wisconsin

The Section of Physical Medicine of the University of Wisconsin Medical School, the Wisconsin Chapter of the American Physical Therapy Association and the Wisconsin Occupational Therapy Association will sponsor the second annual Physical and Occupational Therapy Symposium at the University of Wisconsin Medical School on April 2nd and 3rd, 1949. Details of the program will be announced in the near future.

Advance registration for physicians, physical and occupational therapy technicians will be necessary. There will be no registration fee. For programs write to Dr. Harry D. Bouman, Professor of Physical Medicine, University of Wisconsin Medical School, Madison 6, Wisconsin.

Ellis Linn

It is with regret we announce the death of Ellis G. Linn, of Des Moines, Iowa. Dr. Linn was a member of the Congress for many years and devoted much of his time to the interests of the organization.

BOOK REVIEWS

THE REHABILITATION OF THE INJURED. OCCUPATIONAL THERAPY, Volume I. By *John H. C. Colson*, Technical Director of Rehabilitation, Accident Service, Royal Sheffield Infirmary and Hospital. Formerly Rehabilitation Officer, Pinder Fields Emergency Hospital; Sometime Superintendent, Miner's Rehabilitation Center, Berry Hill Hall. Foreword by E. A. Nicoll, M.D., B.Ch., F.R., C.S., Ed. Second Edition. Cloth with 196 Figures. Pp. 226. Price 15/net, London, Cassell & Company, Ltd., 1945.

The author says that special care has been taken in arranging the material. He says that he has had two main classes in mind: the surgeon or medical man, who wishes to familiarize himself with the principles of occupational therapy, but has not the time to read through a mass of primarily concerned with the elaboration and application of these principles. Each chapter which deals with an occupation as therapy has been divided into three sections:

(1) Remedial use which deals with indications, aims, craft analysis and remedial applications; (2) Craft technic which contains clear working instructions for those who wish to learn the occupation; and (3) Construction work which amplifies the previous section.

The book is recommended to the surgeon or medical man who wishes to familiarize himself with the principles of occupational therapy but has not the time to read through a mass of technical details.

THE REHABILITATION OF THE INJURED. Volume 2. REMEDIAL GYMNASTICS. By *John H. C. Colson*, M.C.S.P., M.A.O.T., Rehabilitation Officer, Birmingham Accident Hospital and Rehabilitation, Formerly Technical Director, Ministry of Health's Training Course in Remedial Gymnastics for ex-Service P. T. Instructors. Sometime Technical Director of Rehabilitation, Accident Service, Sheffield Royal Infirmary and Hospital, etc. Foreword by Sir Reginald Watson-Jones, B.Sc., M.Ch. Orth., F.R.C.S. Cloth. Pp. 556 with 439 illustrations. Price 30/net, London, Cassell & Company, Ltd., 1947.

Sir Watson-Jones in his foreword says: "The death-knell of massage has been sounded. No longer must the patient be lulled to sleep with soothing massage; he must be galvanized into activity by invigorating exercise." Rehabilitation of the injured begins with surgical and manipulative treatment, which is accompanied and followed by physical therapy, exercise therapy, occupational therapy and recreational therapy and is completed by retraining and resettlement. The process is involved, complicated and prolonged. But two principles may be recognized. The first was known to Galen hundreds of years ago. "Confidence and hope to more than physic: he cures most in whom most are confident." The patient must be encouraged, he must be stimulated; he must be inspired; he must learn that success depends upon his effort alone. In achieving this purpose, diversion, occupation and recreation are all needed. But the second principle is equally important. Rehabilitation calls not only for recreation, it calls for work and very hard work. Fun and games may be the apertif, but specific remedial exercise is the meal.

Dr. Watson-Jones, a famous surgeon in his foreword makes a famous contribution to these two books. "Colson's work represents an important part a pioneer development in Great Britain which is of significance to surgeon and physician, physiotherapist and nurse, and all indeed to all concerned in the treatment of patients — a development which is now being recognized and emulated throughout the world." The text of both books is well written, lucid and provocative. The figures are mostly clear and informative. Both books should be read by every surgeon and medical man.

THE BRITISH ENCYCLOPAEDIA OF MEDICAL PRACTICE INCLUDING, MEDICINE, SURGERY, OBSTETRICS, GYNAECOLOGY AND OTHER SPECIAL SUBJECTS. MEDICAL PROGRESS, 1948. Editor in Chief, *Rt. Hon. Lord Horder*, G.C.V.O., M.D., B.Sc., F.R.C.P., Physician to the King; Consulting Physician to St. Bartholomew's Hospital. Fabrikoid. Pp. 511. Butterworth & Co., Publishers, Ltd., Bell Yard, Temple Bar, London, England, 1948.

The contents of this informative and authoritative volume presented under the editorship of a distinguished clinician consists of two chief parts. The first half of the book contains "Critical Surveys" by outstanding medical men on medical fields where special progress has been made. These fields are: Medicine, Surgery, Obstetrics and Gynecology, Pediatrics, Cardiology, Chest Diseases, Acute Infectious Diseases, Aviation Medicine, Industrial Medicine, Forensic Medicine, Psychological Medicine, Tropical Medicine, Chemical Pathology, Progress in Vitamins. The last half of the book presents succinct abstracts of a large variety of topics from Abdominal Pain and Acute Abdominal Emergencies to Yaws. The literature covered is chiefly British and American and a sprinkling of French, Scandinavian and Swiss periodicals. In this section Physical Medicine is represented by only two abstracts, one on hypothermy, giving the essence of Crossman and Allen's article in the A. M. A. Journal of 1947; the other on the indications for physical medicine in rheumatic disorders, giving abstracts of articles by Bach in the ARCHIVES OF PHYSICAL MEDICINE and of Swaim in the *Practitioner*. Between the two main sections there is a 9 page section on recent developments in pharmacology and therapeutics. A

28 page index makes the finding of subjects covered quite easy. This is indeed a unique and eminently practical reference volume on the international aspect of progress in medicine and should be a welcome asset in the library of every progressive physician.

DISEASES OF THE ADRENALS. By *Louis J. Soffer*, M.D., Associate Attending Physician, The Mount Sinai Hospital, New York City; Assistant Clinical Professor of Medicine, Columbia University. Second edition. Price, $6.50. Pp. 320, with 45 illustrations, 3 color plates. Lea & Febiger, Washington Square, Phialdelphia, 1948.

The second edition of this volume appeared before the review of the first edition was published in the ARCHIVES. In the second edition, the material is thoroughly revised, contains virtually all of the recent knowledge concerning the adrenals and presents it clearly and concisely to clinicians and to students of endocrinology.

New studies on the physiology of the adrenals, laboratory procedures for the diagnosis of adrenal cortical disease and new therapeutic measures in the treatment of Addisonian crisis and Cushing's syndrome have been incorporated. Additional features of the new monograph include a detailed description of pathogenic symptomatology and laboratory findings in Addison's disease; an entire chapter on the adrenogenital syndrome, and full consideration of the relationship of the adrenals to all other glands of internal secretion.

This book offers the precise biochemical technics which are helpful in revealing the true nature of these functions of these glands and which enable the physician to understand the diseases associated with them.

AMERICAN MEDICAL RESEARCH PAST AND PRESENT. By *Richard H. Shryock*, Ph.D., Professor of History and Lecturer in Medical History, University of Pennsylvania, Acting Director, American Council of Learned Societies Cloth. Pp. 350. Price, $2.50. The Commonwealth Fund, 41 East 57th St., New York 22, N. Y., 1947.

The term research is a relatively modern one, at least in its present usage, and now carries obvious prestige. For this very reason it is likely to be employed loosely, and it may be well to point out at once the connotation used here. Without any attempt at exact definition, it can be said that the word means a more or less systematic investigation of phenomena intended to add to the sum total of verifiable knowledge. The necessary repetition of the term may leave the impression that it indicates some abstract and almost mystical process. One therefore needs to be reminded that it simply refers to a special type of work that this is always performed by individuals, and that these individuals are human like the rest of us. In psychologic terms, it is a form of behavior peculiar to mankind.

Research as defined implies some degree of planning toward an end. Hence isolated observations of rare happenings, or unplanned trial-and-error improvements in the arts, are not to be considered research. The process is distinct from the empirical accumulations that make up folklore and the practical arts, and is likely to proceed in a more definite direction and at a more rapid pace than those other avenues to knowledge. Applied to medicine, this means that the practitioner who reported in 1807 on "The Use of Nitric Acid in a Chronic Complaint" was not necessarily engaged in research. He may have been willing to try anything once.

This book should be read by everyone engaged in medical research because the story has never before been told and because it is told so well. Beginning with the formative influence, British from 1750 to 1820, French from 1820 to 1860, and German from 1860 to 1895, Dr. Shryock traces the historical development of medical research. No one hitherto has given such a full picture in excellent perspective of the factors which caused American medicine about 1895 to emerge on a level of cultural independence. This whole study will stand as a useful and pertinent contribution to American scholarship.

BRIGHT'S DISEASE. By *Henry A. Christian*, M.D., Hersey Professor of the Theory and Practice of Physic, Emeritus, Harvard University. Cloth. Pp. 385. Price, $9.00. Oxford Press, 114 Fifth Avenue, New York 11, N. Y., 1948.

This volume consists of the similarly titled section as recently rewritten by the same author in the *Oxford Loose-Leaf Medicine*. The text comprises discussion embracing entities with widely divergent pathogenesis as the hepatorenal syndrome, the crush syndrome and amyloidosis as well as those included in the usual conception of Bright's disease. The material is presented from a clinical viewpoint and covers all the aspects of the various diseases.

The book has an adequate index and an extensive bibliography which should prove useful to students. There are several minor grammatical and typographical errors. It deserves a place in the libraries of those interested in renal disease and not possessing the parent system.

ARTERIAL HYPERTENSION. By *David B. Ayman*, M.D., Instructor in Medicine, Tufts College Medical School. Edited by Henry Christian, M.D. Cloth. Pp. 265. Price, $2.50. Oxford University Press, 114 Fifth Avenue, New York 11, N. Y., 1948.

This is a small volume, concise and well written. Hypertension is divided into cases with primary renal disease, those without renal disease and those due to hormone production of certain tumors and to various intoxicants. The author discussed therapy with special diets, thiocyanate therapy and sympathectomy. This digest adds nothing new but does present in an orderly manner a concise summary of available information concerning present aspects of hypertension.

POSTURE AND NURSING. By *Jessie L. Stevenson*, R.N., P.T. Paper. Pp. 96. Price, $0.50. Published and Distributed by the Joint Orthopedic Nursing Advisory Service of the National Organization for Public Health Nursing and the National League of Nursing Education, 1790 Broadway, New York 19, 1948.

This handbook, first published in 1942, was prepared to assist nurses to apply the principles of posture and body mechanics in all activities. Personnel in allied fields, such as physical and occupational therapy, have also used it in their teaching. The present text has been completely rewritten. Discussed in sections are the normal body in activity and rest; movements of joints; posture and activity of the preschool child; posture and activity of the bed patient; posture and body mechanics in maternal and infancy care; posture in the school health program; posture and body mechanics of the worker in industry; posture and body mechanics for the aging; summary of principles of body mechanics and posture and preparation of the nurse for application of the principles of posture and body mechanics. This small pamphlet is exceptionally well illustrated and the presentation is of a nature to make it easily recommended for all those interested in the subject of posture.

PRINCIPLES OF HEALTHFUL LIVING FOR THE INDIVIDUAL AND THE COMMUNITY. By *Edgar F. Van Buskirk*, Ph.D., Professor of Hygiene, Stephens College, Columbia, Missouri. Edited by Carl L. Kline, M.D. (Revised Edition.) Cloth. Price, $3.50. Pp. 474, with illustrations. The Dryden Press, 386 Fourth Ave., New York 16, 1948.

This is a volume intended for instruction of first and second year college students in the principles of healthful living. Following an introductory part on "basic concepts" of environment of a brief survey of the human organism, it is organized into two chief sections, one stressing the individual aspects of healthful living in eleven chapters, the other emphasizing in eight chapters, group health in family and community. Because of the large scope of the subject matter, the specific material presented in many instances is often necessarily quite sketchy but the book is written in a stimulating style and the typography is attractive. A bibliography of one hundred books recommended as suitable for supplementary reading is appended.

PERSONAL AND COMMUNITY HEALTH By *C. E. Turner*, A.M., Ed.M., D.Sc., Dr. P.H., Professor of Public Health Emeritus Massachusetts Institute of Technology; Formerly Associate Professor of Hygiene in the Tufts College Medical and Dental Schools; Sometime Member of the Administrative Board in the School of Public Health of Harvard University and the Massachusetts Institute of Technology; Formerly Visiting Professor of Health Education, School of Public Health, University of California. Eighth Edition. Cloth. Price, $4.00. Pp. 565, with illustrations. C. V. Mosby Co., 3207 Washington Blvd., St. Louis 3, 1948.

Through eight successive editions this work has become a recognized textbook for health instruction. It presents clearly and quite extensively the essential, present-day knowledge of personal and community health within available time and space limitations and with enough anatomy, physiology and other underlying sciences to clarify and support the health teaching. It reflects the continued teaching experience of the writer and of many other teachers who have used the book. It is divided into two main parts: personal health and community health. References at the end of each of the 31 chapters give a brief list of recent or older significant books on specific topics. Appendix A gives on 75 pages a complete outline of the control of communicable diseases from actinomycosis to vulvovaginitis. Appendix B gives a brief summary of the chemical and physiologic principles involved in the action of the various disinfectants and certain facts relative to their use. Finally, there is a complete glossary and a list of prefixes, suffixes and combining forms to help the student understand technical terms. A goodly number of excellent illustrations serves to further clarify the material presented.

REMEDIAL EXERCISES FOR CERTAIN DISEASES OF THE HEART AND LUNGS. By *Hester S. Angove*, M.C.S.P. Member of Council and Examiner, the Chartered Society of Physiotherapy. Teacher of Physiotherapy, National Institute for the Blind. Late Sister in Charge of Massage School and Department, Guy's Hospital. Trained Nurse, Adelaide and Guy's Hospital. Cloth. Price, 10s. 6d, net. Pp. 18 with illustrations. Faber & Faber, Limited, 24 Russell Square, London W. C. 1, 1948.

This small book considers a few of the diseases of the heart and lungs with brief discussions of the etiology, symptoms, signs, general medical management, followed by instructions for massage and specific exercises. Suggestions are given for breathing, arm and leg exercises and advice as to general body activity and work. The book should appeal to physical and occupational therapy technicians, nurses and personnel interested particularly in the program of rehabilitation as applied to the various stages of such diseases.

The book has numerous errors, really too many, on the information for the subjects other than physical medicine. Its chief merit consists of calling attention to the fact that relatively simple physical methods can be employed to advantage. It demonstrates to the general physician and others how the additional use of physical medicine could be included in the routine care of various diseases of the heart and lungs. Too often none of these measures are ever considered in the patient's care. To show what can be accomplished by the rational use of physical medicine, it is only neces-

sary to note the results that have occurred in the operative chest cases with the program of exercises pre- and post-operatively. This has been most dramatically demonstrated by the Veterans Administration Hospitals. The chapter of this book for such conditions is not complete nor helpful.

Excessive enthusiasm probably accounts for the advice of massage over the liver in acute heart failure in order "to give much relief and often induce sleep" or for varicose veins "fine vibrations over the course of the vein will produce a contraction in its muscle wall" or in pleurisy "general kneading has been proved to increase lymphocytic count" or "gentle shaking of the chest wall tends to assist expiration and loosen any retention of mucus." The author is to be complimented for preparing this edition — it could be improved by better medical advice.

TECHNIC OF MEDICATION. By *Austin Smith*, M.D., C.M., MSc., Director, Division of Therapy and Research, and Secretary, Council on Pharmacy, and Chemistry, American Medical Association. Professional Lecturer at The University of Chicago, Department of Pharmacology. Fabrikoid. Pp. 255. Price, $4.00. J. B. Lippincott Company, East Washington Square, Philadelphia 5, Pa., 1948.

This book is a successor to three editions of the classic "The Technic of Medication" by the late Bernard Fantus. It is practical and specific in its description of daily recurring problems of the physician in determining the need of medication, the choice of route of medication, effects to be expected, and desirable supporting measures. There are chapters on general considerations in medication; the prescription; oral administration; parenteral administration; rectal and genitourinary administration; application to the skin; mucous membrane applications; and physical aids.

The book has been brought up to date not merely by the addition of such topics as the use of oxygen and the hypospray, but by a thorough rewriting in the light of the most recent developments. It is modern even in its faults, of which the present critic has been able to discover one. The verb "to differentiate" was once the property of mathematicians and embryologists, and was reserved for very special meanings. It should not be used as a synonym for the verb 'to distinguish" as it is on page 236 in the phrase "to differentiate a catheter from a sound." The indiscriminate use of "differentiate" is one of the irritating little peculiarities of present-day medical writing.

The present author has caught to a remarkable degree the spirit and style that characterized Fantus' original contribution, compact and positive recommendations with a minimum of theoretical and negative information. Often the implications of a sentence are seen to be so far-reaching as to suggest a slyly humorous understatement, as in the concise direction for the sterilization and storage of instruments. This book will bear, and certainly deserves, close study, and no medical student should feel that he is ready for his internship unless he has gone through it with care.

LIVE LONG AND LIKE IT. By *C. Ward Crampton*. Public Affairs Pamphlet No. 139. $0.20. Public Affairs Committee, Incorporated, 22 East 38th Street, New York 16, N. Y., 1948.

This small pamphlet is being used by many physicians for distribution to patients. The pamphlet contains many charts. It discusses dietary aids for the aging, what exercise can do for you and other topics of interest in the field of geriatrics.

CLINICAL UROLOGY. ESSENTIALS OF DIAGNOSIS AND TREATMENT. By *Lowrain E. McCrea*, M.D., F.A.C.S., F.I.C.S., Clinical Professor of Urology, Temple University Medical School; Attending Urologist, Philadelphia General Hospital. Cloth. Price, $6.50. Second Edition. P. 493 with 263 illustrations, 7 in color. F. A. Davis Company, Publishers, 1914-1916 Cherry Street, Philadelphia 3, 1948.

The second edition of Doctor McCrea's succinct and well-organized textbook on "what, how and when?" in clinical urology is worthy of careful reading. Starting with the chapter on "The Study of the Patient," the author continues systematically through chapters on diseases of the penis and the urethra, diseases of the scrotum and its contents, diseases of the prostate, bladder, ureters and kidneys. Finally, there are chapters on impotence and sterility, on urology in the female and on urology in children.

The large number of excellent illustrations increases the clarity of this carefully arranged and most practical textbook. The volume can be recommended to all practitioners who are interested in a clear, concise discussion of clinical urology.

PHYSICAL MEDICINE ABSTRACTS

Physiology of Neuromuscular Junctions: Electrical Aspects. Stephen W. Kuffler.

Federation Proceed. 7:437 (Sept.) 1948.

The preliminary experiments reported here in connection with "transmitter" problems represent an attempt at elucidating the role of action currents in transmission. They are mainly based on the assumption that penetrating currents should produce an electrically detectable membrane change.

The discussion is confined to the "transmitter" problem, i. e., to the mechanism by which the nerve impulse gives rise to the end-plate potential. Duration and intensity of the "transmitter" is analyzed. In this connection the ACh and action current theory of transmission is briefly discussed. Some new experiments, testing the efficacy of current flow in the terminal nerve region on the trans-junctional region, are presented. Potential changes were recorded from the end-plate regions of isolated preparations, while stimuli were applied within 0.5 mm. to the nerve nearby. Subthreshold depolarization of the nerve terminals by applied currents or by blocked nerve impulses did not affect appreciably the end-plate membrane. Neuromuscular delay periods were measured and are discussed in relation to current spread from nerve to muscle.

It is concluded that (a) action currents in the terminals are not effective in depolarizing the end-plate region. (b) The "transmitter" action occurs during the "breakdown" in the terminals. The "breakdown" period is too short to account for the analyzed "transmitter" duration. Prolongation of the depolarization in the terminals does not prolong transjunctional potentials. It is thought that ions liberated during the "breakdown" in the nerve terminals could best account for the observed phenomena.

Aspects of Rheumatic Disorder. Philip Hench.

Brit. M. J. 4581:754 (Oct. 23) 1948.

Fibrositis is the chief rheumatic disease from which psychogenic rheumatism must be differentiated. In general, fibrositis places its victim at the mercy of change in external environments (such as heat or cold) while psychogenic rheumatism intensifies or recedes with change in internal environment (mood, excitement, worry, fatigue). Physical therapy has had variable results, sometimes making the patient worse. There was resistance to examination — the "touch me not" reaction — whereas in fibrositis the examination found a cooperative patient.

In the U. S. Army during the war psychogenic rheumatism was far down in the list of neuroses. The pain that these patients endured was real. Hench impressed upon them the following: "Now I have not said that your pain is imaginary, it is real, and it is just as severe as you say it is. Don't go home and say I said it was "all in your head." And don't go home and say "that nothing can be done for it; many things can be done for it."

Hemiplegia.

Brit. J. Phys. Med. 11:129 (Sept.-Oct.) 1948.

It is reasonable to assert that, if a patient with hemiplegia fails to receive adequate treatment, one must attribute the deficiency to lack of facilities rather than to lack of interest.

Benefit is to be expected from the use of heat therapy and muscle reeducation. By means of the latter procedure the patient learns how to relax the spastic muscles and how to reestablish coordination. Exercise for the upper limbs should be designed to relax the flexor muscles and to strengthen the extensors. At first, single joints should be exercised; later on, more complex movements are allowed. Success is all the more likely to be achieved with the aid of occupational therapy. When contractures or adhesions limit movement at the shoulder joint pulley exercises serve to increase the range of motion.

Lowman recommends the use of the Hubbard tank for reeducative exercises in water. The exercises are of thirty minutes' duration, and are given from 3 to 6 times a week.

Prolonged recumbency for hemiplegia is regarded with disfavor. Early ambulation offers the surest hope of securing effective reeducation, but in selecting the right moment to initiate this radical change in posture the physician is faced with one of the most difficult problems in the whole range of medicine.

Transverse Rotation of the Segments of the Lower Extremity in Locomotion. A. S. Levens; Verne T. Inman, and J. A. Blosser.

J. Bone & Joint Surg. 30-A:859 (Oct.) 1948.

A complete analysis of human locomotion is difficult. The fact that persons walk and run with apparent ease, and without conscious effort, does not imply that the mechanisms employed are simple or readily understood. A comprehensive study of locomotion includes not only analysis of the movements of the various segments of the body, but also the correlation of these movements with force studies and muscle action. Consideration of a problem of such complexity suggests that delimitations are necessary, and the present study endeavors to present but one component in the displacement pattern of the lower extremity.

At the present time no prosthesis for the lower extremity has purposely incorporated mechanisms to provide for transverse rotatory motions, except on an experimental basis. Suppressing this rotation prevents the prosthesis from approaching the behavior of a normal extremity, and thus requires alterations in the normal pattern of movement of the joints proximal to the amputation. Relative motion will take place where the resistance to torque is the least. During weight-bearing in the stance phase, this motion will tend to occur between the stump and the socket, producing a most uncomfortable force on the stump. This is particularly true of the above-the-knee suction-socket limb. In the below-the-knee amputee, in addition to the major rotations that occur between the trunk and the fixed foot position, there is further restriction of rotatory motion at the knee, produced by the side hinge bars connecting the thigh lacer and the shank. In the case of below-the-knee amputees who have adequate stump length and shape, the use of suction sockets and an ankle mechanism may make it possible not only to provide for transverse rotation, but also to do away with side hinge bars and lacers, which tend to restrict the normal action of the knee.

The incorporation of a simple mechanism which provides for transverse rotation of sufficient magnitude, together with a unit for the return of the foot to the normal position, may well constitute a major contribution to both the comfort of the amputee and the improvement of function and synchrony in walking. An experimental mechanism has been used on this project. All amputees who have employed this mechanism have attested to the very marked improvement in comfort.

Resuscitation. Council on Physical Medicine and the American National Red Cross.

J. A. M. A. **138**:23 (Sept. 4) 1948.

In asphyxia it is vitally important that artificial respiration be started without a moment's delay.

The American National Red Cross and other organizations have taught the prone pressure method. This method has several important advantages; (1) It requires no apparatus of any kind and therefore can be started immediately. (2) It is easy to administer properly and has been proved effective in countless cases of asphyxia. (3) The victim lies prone; thus there is little danger of occlusion of the respiratory passage by the tongue.

An inhalator is an apparatus that delivers to the victim gas, usually oxygen, under low, continuously positive pressure. The resuscitator delivers the gas under either alternating positive pressure or alternating positive and negative pressure. Many apparatus now available can be adjusted to act either as inhalators or resuscitators.

It is important that a resuscitator of reliable type be used, and that it be checked at times to assure its proper adjustment. If the positive or negative pressures increase or decrease appreciably, insufficient ventilation of or damage to the victim's lungs may occur. It is highly important that people who operate the resuscitator be adequately trained concerning when and how to use the apparatus.

The air passages must be free from obstruction. The tongue sometimes presses back into the pharynx, shutting off the airway. The first aider should insert two fingers far back into the mouth and press downward and forward on the tongue.

If an accepted resuscitator is at hand, it may be substituted for manual artificial respiration with assurance that sufficient ventilation will occur. Manual artificial respiration, however, is all-important while the rescuer awaits a resuscitator. Use of the manual method should continue while the resuscitator is being adjusted, so that the victim's lungs constantly receive air.

If a person has not been breathing for five to ten minutes, the chance of survival is slight, even if the most efficient inhalators or resuscitators are used. Nevertheless, an attempt at resuscitation should be made when the slightest chance for recovery exists. Artificial respiration should never be stopped when a pulse or heart beat can be felt.

Contributions to Clinical Electromyography, II Phenomena of Reciprocal Contraction of Symmetrical Muscles and Its Significance in Muscle Reeducation. Paul Liebesny, and Morris G. Blutstein.

Am.Practitioner **3**:103 (Oct.) 1948.

The phenomenon of reciprocal contraction of symmetrical muscles has been discussed. If symmetrical muscles contract synchronously but with unequal force, the muscles contract with reciprocal strength. This phenomenon has to be considered in muscle reeducation. Active exercises against resistance of spastic, paretic muscles have to be avoided, whereas resistance has to be applied to flaccid, paretic muscles during active exercises. The effect of impairment of the blood circulation in muscles and the changes of the EMG tracings caused by it have been demonstrated, and the probable usefulness of electromyography in the examination of peripheral vascular diseases has been indicated.

Progressive Spinal Muscular Atrophy. I. Irving Weintraub.

J. Florida M. A. **35**:291 (Nov.) 1948.

A Rip Van Winkle who has gone to sleep more than a century ago would wake today to find no essential change in the knowledge of the medical profession concerning many of the muscular atrophies. True, during this span of years, these atrophies have been classified and grouped and have undergone experimentation, but in 1948 the cause and the treatment still are unknown.

Treatment discussed is essentially sympotomatic. There is rest for the atrophic part and avoidance of exertion as helpful, electrical treatment as doubtful and possibly harmful, massage

as useless, vitamin therapy as unencouraging and orthopedic appliances as possible.

There is presented a review of the past history of a patient, it is impossible to say that the patient at the age of 2 did not have poliomyelitis, which was diagnosed as rheumatism. The family stated that the legs were swollen and extremely tender to touch and that the child was unable to walk. In view of this illness, one cannot say that this patient does not then fall into a category with chronic poliomyelitis. It seems, however, that a logical discussion would place it as progressive spinal muscular atrophy since there was no sensory involvement and no involvement of the pyramidal tract was present. The difference apparently between chronic poliomyelitis and progressive spinal muscular atrophy is that of a past history of acute poliomyelitis.

The patient was treated symptomatically and also specificially with injections of vitamin B complex. Following these injections there were no noticeable objective changes, but the subjective changes were great. For this reason this medication was continued until the patient was admitted to the hospital with respiratory failure.

Treatment of Fractures in General Practice. L. C. Powell.

Texas State J. Med. **44**:440 (Oct.) 1948.

The limb is generally not capable of its full use when the bony fragments have just united in good position. Young patients may return to work in a few weeks. It is necessary to allow older persons, especially those with a fracture of femur or tibia, from two to six months longer before hard work can be undertaken. In spite of good position of the fragments, in spite of exercise of the limb during the period of immobilization, the muscles have become weak and the lower leg swollen. If physical therapy is carried out in the right manner and begins only when the bones have properly united, no damage can be done, and the injured man, particularly when he is insured, has a feeling that something is being done for him. Massage and passive movements employed too early interfere with the rest necessary for healing and cause pain.

The Chronic Invalid. Edward L. Bortz.

J. A. M.A. **138**:745 (Nov. 6) 1948.

The patient with chronic illness is one of the major challenges to modern society. Sooner or later some form of long term illness affects one or more members in most families of the nation. Approximately 2,000,000 of our population are chronic invalids at the present time, and the number is steadily increasing. It will increase still more as the control of other disorders which were so devastating heretofore is now being more effectively managed.

As more persons are living longer, there is more opportunity for chronic illness to develop. To this extent aging of the population may be regarded as a contributory factor. However, it should be kept in mind that aging and chronic invalidism are not synonymous by any means. The misconception that old age is constantly visited by chronic invalidism must be dispelled. Many persons now have a vigorous and enjoyable senectitude free of prolonged illness.

Long term illness produces an added burden on the patient's family. It adds one more problem case to the social agencies who exist for the purpose of neutralizing adverse social influences. If the invalid is the wage earner, the family's economic predicament becomes immediately acute, and economic dependency on society may result. Medicine has much to offer a world which is suffering from insecurity and which longs for peace of mind.

Some Industrial Aspects of Rheumatism. Thomas Ferguson.

Practitioner **161**:170 (Sept.) 1948.

If the amount of invalidism from rheumatism is to be reduced, there must be an expansion of treatment facilities in industrial centers with the provision of treatment facilities available at times which permit of their use by workers without encroachment on working shifts. Pressure on limited existing facilities for physical therapy is so great that it is often difficult for the industrial worker to secure treatment directed to the relief of pain, especially in cases in which spectacular cure is no longer possible.

Acute rheumatism, unlike the more chronic forms of the disease, is not a major contribution to incapacity for work among the insured population, nor does it fluctuate with occupational groups to the same extent as the other. But acute rheumatism is of considerable industrial importance and not nearly enough attention is given to skilled vocational guidance designed to see that the person with a history of acute rheumatism seeking to enter industry is, from the first, trained for work consistent with his capacity. It too often happens that young people with gross rheumatic heart disease are allowed to drift into work involving heavy physical demands which can only lead to early breakdown. In this connection it is worth recalling that some employments eminently suited to the physician and mental capacities of these youngsters are more or less closed to them by the operation of superannuation schemes, sufficiently drastic in their pre-employment requirements to exclude potential workers with rheumatic heart disease from employment of a kind most likely to afford them success and happiness in life.

Bringing Rehabilitation to the Voluntary General Hospital. Maxwell S. Frank, and Michael B. Miller.

Hospitals **22**:37 (Nov.) 1948.

The future plan of therapy provides for an organized daily schedule for patients assigned to physical medicine, to be followed throughout the day. Activities will be listed for each patient, depending upon his status of convalescence. Provisions for occupational therapy will also be made

as soon as practicable. It is realized that rehabilitation cannot be successful if the patient is exposed to it only for thirty or sixty minutes a day. Only a daily graduated plan on a full-time schedule can be completely effective. The department of rehabilitation will function, as it should, on a full time basis.

In line with modern practices, an important function of the department will be an organized service for the scientifically directed early ambulation and convalescence of the postsurgical patient. This is in the best interests of both hospital and patient and will result in a more rapid recovery, a shorter hospital stay and a greater availability of beds.

A program must depend for its success, to a large extent, upon its acceptance by the medical profession. Acceptance, in turn, depends upon the educational activities in this direction sponsored by the hospital. These should include lectures and demonstrations to the house staff, participation in general medical conferences in the hospital, participation in conferences of the specialties where cases common to both specialties are involved, the conduct of conferences within the department itself, and ward and classroom lectures to the school of nursing. Publication of research on current problems is also an important function in the operation of the department.

As the department develops and its importance to the community increases, a more effective integration will be sought between the social service department of the hospital and the various voluntary organizations interested in rehabilitation. It is hoped that this report may foster interest in the development of medical rehabilitation progress in other voluntary general hospitals.

Tentative Minimum Requirements for Acceptable Direct Reading Electroencephalographs. Report of the Council on Physical Medicine of the American Medical Association.

J. A. M. A. **138**:958 (Nov. 27) 1948.

The requirements in this report are based on recommendations drawn up by the American Electroencephalographic Society (1947). The recommendations of the society were intended as recommendations to manufacturers, not as minimum requirements. In these requirements it should be noted that certain items are specified herewith as minimum requirements for council acceptance; others are stated as the recommendations of the American Electroencephalographic Society for desirable features for higher standards of performance.

Osteoarthritis and Its Treatment. Ernest Fletcher.

Brit. J. Phys. Med. **11**:136 (Sept.-Oct.) 1948.

Adjustment of posture is important, for joints put at a mechanical disadvantage will always tend to show degenerative changes after a suitable lapse of time. Physical therapy is most useful. For the pain described in the table some form of heat seems to be best, and perhaps diathermy gets nearer to the site of the trouble than does any other form. In the case of osteoarthritis of the hips very intensive treatment is needed, at least one hour a day, five days a week, and this is the only form of physical therapy which affects the condition. Weakness and wasting of muscles are usually treated by nonweight bearing exercises particularly of the active type and some people use faradism, although this is hardly justifiable on a physiologic basis. Particularly tender spots in the joints, if fairly well localized, are probably best treated, in the field of physical therapy, by erythema doses of ultraviolet irradiation given with the Kromayer lamp. The acute inflammatory episodes are undoubtedly best treated by diathermy.

Gentle stretching of the capsule under an anesthetic sometimes relieves the pain for a considerable period. Surgery has a place in the treatment, especially in the hip joint, for which a vitallium cup arthroplasty is a popular operation.

The Production of a Persistent Alteration in Influenza Virus by Lanthenum or Ultraviolet Irridiation. Sven E. Bjorkman, and Frank L Forsfall.

J. Exper. Med. **88**:445 (Oct. 1) 1948.

The rates of elution from RBC of the Lee and PR8 strains of influenza virus were studied by means of a step-wise elution Technic. By means of a single treatment with lanthanum acetate or irradiation with ultraviolet and subsequent passage in chick embryos, it was possible to alter the eluation rate of the Lee strain so that it was similar to that of the PR8 strain. This alteration proved to be persistent on serial passage in the absence of the agent which caused it.

Alternating Pressure Alleviates Bedsores. W. James Gardner, and Ruth M. Anderson.

Mod. Hosp. **71**:72 (Nov.) 1948.

Bedsores result from death of tissue owing to inadequate nutrition. The most important factor responsible for the inadequate nutrition is slowing or arrest of the capillary circulation resulting from compression of the blood vessels between the patient's bony prominences and the mattress. This occurs more readily if the blood pressure is low or if the patient's weight is concentrated in small areas because of a lack of cushioning subcutaneous tissue.

A second important factor responsible for inadequate nutrition is poor quality of blood being brought to the tissues. A third important element responsible for inadequate nutrition is increased metabolic demands by the tissues resulting from fever, from local inflammation or from trauma. A fourth factor, as pointed out by Munro in cases of spinal cord injury, is loss of the local cutaneous vascular reflexes.

Described in the article is an alternating pressure mattress which is constructed of a flexible waterproof plastic material. It is placed on top of an ordinary mattress and then the bed is made up as usual except that since the mattress is waterproof — it does not need a rubber sheet

and is easily washed after each patient's use. The mattress is well tolerated; most patients rather enjoy the sensation of movements beneath them. It produces no friction of the skin, but merely a gentle compression and release. The alternating pressure mattress has been in use in the Cleveland Clinic Hospital since July, 1947.

None of the thirteen patients having decubiti could turn himself and their position was turned only every three to four hours. The physical condition of all these patients was generally poor. The patients stated that they received comfort from the air mattress whenever they were in a condition to comment rationally.

General Principles and Purposes of Tracer Studies. Chalmers L. Gemmill.

U. S. Nav. Med. Bull. **48**:649 (Sept.-Oct.) 1948.

The problem is discussed "who should use radioactive tracers?" At various conferences, there seem to be two schools of thought. One group states that the work should be done only in centers: Brookhaven, Chicago, Rochester, Army or Navy laboratories. If a man has a problem he should go to one of these laboratories or even send his problem for solution to a large established group. The other school of thought maintains that the use of isotopes is as easy and common as the use of the chemical balance. Every laboratory should have facilities for isotope work and use isotopes as the problems arise. Isotopes can be used in a small laboratory if facilities and money are available.

There is then discussed what radioactive isotopes are available for biological work. Theoretically the isotope must be obtainable in pure form and have (1) suitable half-life; (2) proper biological behavior; (3) proper chemical behavior; and (4) proper radiation spectrum.

The last problem discussed is that of the quantitative detection of the amount of radioactive substance present in tissues. A general discussion has been given of isotopes as tracers in biological work. The types of isotopes available and the quantitative nature of this work has been discussed. It may be stated that isotopes are a valuable tool in metabolic research. There is still a great deal, however, that can be done with the classical methods. Isotopes are not the final answer to all problems, but aid greatly in obtaining many results not given by the classical methods.

Clinical Manifestations of Infection with Poliomyelitis Virus. Albert E. Casey; William I. Fishbein; Francis B. Gordon; Frank M. Sohabel, and Herman N. Bundesen.

J. A. M. A. **138**:865 (Nov. 20) 1948.

Most of the clinical observations on poliomyelitis have been limited to that relatively rare form of the disease which results in residual paralysis. Even here no controlled observations have been published which enable one to say whether a great variety of symptoms are really typical of this disease. For instance, current articles in the foreign and American literature list diarrhea, sore throat, running nose and cough as symptoms of polioylemitis, but offer no proof. It may be said with safety that outside of paralysis or paresis in a child with an acute febrile illness resulting in head drop, stiff neck and stiff back, and usually accompanied with moderate increase in the spinal fluid protein or cells, no symptoms have been firmly established. Children without these signs from whom the virus has been recovered have often been erroneously called "healthy carriers."

In the special survey of poliomyelitis which has been conducted in Chicago during the past three years, controlled field experiments were planned to elucidate the symptoms of all forms, but especially of the subclinical variety. Subclinical poliomyelitis may be defined as poliomyelitis without stiff neck, stiff back, paralysis or obvious paresis. It is the common or usual manifestation in persons infected with this virus and a comparison of the symptoms in the subclinical and clinical forms is presented.

The symptoms reported by 97 children with poliomyelitis are compared with those among 66 noncontact children living in the same block with the patients, and among 91 control children living in neighborhoods ten or fifty blocks distant. Poliomyelitis was proved in each child by the recovery of virus from the stool or throat and/or by the occurrence of elevated levels of spinal fluid protein twenty-one to forty-five days after intimate contact with an infectious patient.

Thirty-three of the 97 had clinical poliomyelitis characterized by paralysis, paresis, head drop, stiff neck or stiff back. The remaining 64 were intimate contacts of infectious patients in whom subclinical poliomyelitis characterized by an absence of the aforementioned signs developed within five to twenty-one days after exposure.

No differences in the symptoms between the noncontact children and the controls were detected. Mild fever of short duration, headache, vomiting, constipation, myalgia and drowsiness characterized both the clinical and the subclinical forms of poliomyelitis, the difference being one of degree and increased frequency among the former. Sore throat was definitely not a symptom of the subclinical variety, but was significantly related to stiff neck, stiff back and paralysis or paresis. The possibility is discussed that the presence of sore throat in clinical cases, and its absence in subclinical cases might coincide with the quantity of virus present in the throat and in the nervous system, with the infectiousness and clinical severity and with certain epidemiologic features of the disease.

Running nose, diarrhea and cough were definitely not related to the symptoms of either clinical or subclinical poliomyelitis. Evidence of poliomyelitis among children 6 years of age and under is difficult to obtain without an adequate field study, even though 80 to 100 per cent of such children succumb on exposure. The younger patients are less likely to report minor symptoms described in almost every instance by older children.

PHYSICAL MEDICINE ***

The following services are approved by the Council and the American Board of Physical Medicine

Hospitals, 34; Assistant Residencies and Residencies, 70

Name of Hospital	Location	Chief of Service	Patients Treated	Number of Treatments	Asst. Res. and Residencies Offered[a]	Beginning of Service (1948)	Length of Service Offered (Years)	Beginning Stipend (Month)
United States Army								
†Letterman General Hospital★	San Francisco	A. V. Bateman	5,994	285,400	2	1/1	1–3	n
†Fitzsimons General Hospital★	Denver	J. H. Kuitert	2,506	119,005	2	1/1	1–3	n
Walter Reed General Hospital★	Washington, D. C.	E. M. Smith	8,573	238,036	3	1/1	1–3	n
†Percy Jones General Hospital★	Battle Creek, Mich.	A. E. White	28,849	346,505	2	.....	1–3	n
Veterans Administration								
Veterans Admin. Hospital	Chamblee, Ga.	W. Steiner	.....	20,400	1	7/1	1+	$275.00
†Veterans Admin. Hospital	Hines, Ill.	L. Newman	37,369	482,960	7	.....	1–3	275.00
Veterans Admin. Hospital	Framingham, Mass.	F. Friedland	10,130	194,794	2	7/1	1–2	275.00
†Veterans Admin. Hospital	Jefferson Barracks, Mo.	F. Ewerhardt	2,589	71,974	2	7/1	1+	275.00
†Veterans Admin. Hospital	New York City	H. Kessler	21,729	287,884	3	1/1, 7/1	1–3	275.00
†Veterans Admin. Hospital	Portland, Ore.	E. W. Fowlks	3,230	65,750	1	7/1	1–3	275.00
Nonfederal								
†Los Angeles County Hospital★[4]	Los Angeles	O. Huddleston	.....	14,633	2	Varies	2	.....
†White Memorial Hospital★	Los Angeles	F. B. Moor	500[b]	20,000[b]	1	7/1	1–3	147.33
Stanford University Hospital★[4]	San Francisco	W. H. Northway	.....	6,561	2	7/1	1–2	50.00
†University of California Hospital★†	San Francisco	F. Baker	.....	7,123[b]	1	7/1	1	50.00
University Colorado Medical Center								
†Colorado General Hospital★[4]	Denver	H. Dinken	2,905	64,050	1	Varies	1–3	75.00
†Emory University Hospital★	Emory Univ., Ga.	R. L. Bennett	7,836	.....	1	.....	1–3	.....
†Georgia Warm Springs Foundation	Warm Springs, Ga.	R. L. Bennett	.....	84,000	1	.....	1–3	.....
Michael Reese Hospital★[4]	Chicago	C. O. Molander	1,534	16,282	2	7/1	1	25.00
Passavant Memorial Hospital★[4]	Chicago	J. S. Coulter	7,784[b]	12,696[b]	2[h]	.....	1	.....
University of Kansas Hospital★	Kansas City, Kan.	Donald L. Rose	2,775	25,347	3	.....	1½	.....
†Massachusetts General Hospital★	Boston	A. L. Watkins	1,639[b]	16,265[b]	2	.....	1–3	41.67
†University Hospitals★[4]	Minneapolis	M. Knapp	7,677	12,141	2	7/1	1–3	115.00
Mayo Foundation	Rochester, Minn.	F. H. Krusen	.....	**	6	.....	3	.....
†Bellevue Hospital, Div. III—N. Y. Univ.★	New York City	H. A. Rusk	.....	.....	7	Varies	1	70.00
†Goldwater Memorial Hospital★[4]	New York City	H. Behrend	872	53,738	1	.....	1	120.00
†Hospital for Joint Diseases★[4]	New York City	J. Weiss	78,386	91,746	2	1/1	1+	40.00
†Montifiore Hospital for Chronic Diseases★	New York City	K. Harpuder	.....	.....	1	.....	1+	50.00
†Mount Sinai Hospital★[4]	New York City	.....	7,310	9,920	1	1/1, 7/1	1	50.00
†Presbyterian Hospital★[4]	New York City	W. B. Snow	77,771	221,144	1	.....	1	41.66
St. Luke's Hospital★	New York City	R. Muller	2,123	104,604	1	Varies	1	50.00
†Cleveland Clinic Foundation Hospital	Cleveland	W. J. Zeiter	16,257	39,919	1	7/1	1–3	100.00
†Hospital of the Univ. of Pennsylvania★[4]	Philadelphia	G. M. Piersol	1,078	12,883	1	Varies	1	.....
†Medical College of Virginia, Hosp. Div.★	Richmond, Va.	.....	2,053	32,512	1	.....	1	46.50
†State of Wisconsin General Hospital★[4]	Madison, Wis.	H. D. Bouman	3,050	38,382	2	7/1	3	25.00

** Mayo Foundation Fellowships — The Mayo Foundation for Medical Education and Research, Rochester, Minn.: Three-year fellowships beginning quarterly leading to the degree of M.S., or Ph.D., with field named from the University of Minnesota in Physical Medicine; stipend $1,110 per year. Address applications to The Mayo Foundation, Rochester, Minn.

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4 Residencies open to women.

*** Rep. in part J. A. M. A. 137:71 (May) 1948.

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Name and Location of School	Medical Director Technical Director	College Affiliation	Entrance Requirements *	Duration of Course	Time of Admission	Maximum Enrollment	Tuition	Certificate, Diploma, Degree
Childrens Hospital, Los Angeles	Samuel Mathews, M.D. Miss Sarah S. Rogers	Univ. Calif. at Los Angeles	a-b-d	14 mos.	Sept	14	$309	Cert. or Deg.[11]
College of Medical Evangelists Los Angeles[2]	Fred B. Moor, M.D. R. William Berdan	School of Medicine Coll. Med. Evangelists	a-b-c-d	12 mos.	Sept	20	$225	Cert. or Dipl.
University of California Medical School, San Francisco[3]	Lucille Eising, M.D. Mrs. Margery L. Wagner	Univ. Calif.	d-e	12 mos.	Sept	12	$220[8]	Cert. or Degree
Stanford University, Stanford University, Calif.[4]	W. H. Northway, M.D. Miss Lucille Daniels	Stanford Univ.	a-b-d	12 mos.	JanJune	48	$523.30	Cert. or Degree
Northwestern University Medical School, Chicago	John S. Coulter, M.D. Miss Gertrude Beard	Northwestern Univ.	a-b-d	12 mos.	Oct	16	$150	Certificate
State University of Iowa Medical School, Iowa City	W. D. Paul, M.D. Miss Olive C. Farr	State Univ. Iowa	f	12 mos.	Sept	....	$200	••
University of Kansas School of Medicine, Kansas City[5]	Donald L. Rose, M.D. Mrs. Ruth G. Monteith Miss Lilyan G. Warner	Univ. Kans.	a-b-c[2]	12 mos.	FebSept	20	$ 80[3]	Cert. or Degree
Bouvé-Boston School of Physical Education, Boston	Howard Moore, M.D. Miss Constance K. Greene	Tufts Coll.	c[4]	4 yrs.	Sept	15	$250[9]	Cert. or Degree
Boston University, College of Physical Education for Women, Sargent College, Cambridge, Mass.	Kenneth Christophe, M.D. Miss Adelaide L. McGarrett	Boston Univ. Med. Sch.	H.S.	4 yrs.	Sept	25	$450	Diploma or Degree
University of Minnesota, Minneapolis[1]	M. E. Knapp, M.D. Miss Ruby Green	Univ. Minn.	H.S.	4 yrs.	Oct	16	$530[3,9]	Degree
Washington U. School of Medicine,[1] Barnes Hospital, St. Louis	S. Mead, M.D. Miss Beatrice F. Schulz	Wash. Univ. Sch. Med.	c	2 yrs.	Sept	20	$400 yr.[12]	Degree
St. Louis University School of Nursing, St. Louis[1]	A. J. Kotkis, M.D. Sister Mary Imelda	St. Louis Univ.	a[2]	4 yrs.	Sept	12	$200 yr.	Cert. or Degree
Columbia University, College of Physicians and Surgeons, New York City[1]	William B. Snow, M.D. Miss Josephine L. Rathbone	Columbia Univ.	a-b-c[6]	2 yrs.	Sept	35	$450 yr.	Cert. or Degree
New York University School of Education New York City[1]	George G. Deaver, M.D. Miss Elizabeth C. Addoms	New York Univ.	a-b-d	12 mos.	Sept	40	$525	Cert. & Degree
Duke University School of Medicine, Durham, N. C.[3]	Lenox D. Baker, M.D. Miss Helen Kaiser	Duke Univ.	a-b-d	15 mos.	Oct	12	$300	Certificate
D. T. Watson School of Physiotherapy, Leetsdale, Pa.[1]	Jessie Wright, M.D. Miss Kathryn Kelley	Univ. Pittsburgh	a-b-d	12 mos.	Oct	30	$300	Dipl. or Degree
Graduate Hosp. of the Univ. of Pennsylvania, Phila.[1]	G. M. Piersol, M.D. Miss Dorothy Baethke	Univ. Penna.	a-b[10]-g	12 mos.	Sept	20	$300	Certificate
University of Texas School of Medicine, Galveston[1]	G. W. N. Eggers, M.D. Miss Ruby Decker	Univ. Texas	a-b-d	12 mos.	Jan	8	$143[3]	Certificate
Baruch Center of Physical Medicine of the Medical College of Virginia, Richmond, in affiliation with Richmond Professional Institute, Richmond, Va.[1]	Walter Jerome Lee, M.D. Miss Susanne Hirt	Med. Coll. Virginia	a-b-c[7]	12 mos.	Sept	40	$351[3]	Cert. or Degree
University of Wisconsin Medical School, Madison[1]	Harry D. Bouman, M.D. Miss Margaret A. Kohli	Univ. Wis.	H.S.	4 yrs.	Sept-Feb	20	$450[3,9]	Cert. & Degree
University Southern California, Los Angeles	Charles L. Lowman, M.D. Charlotte Anderson	Univ. of S. Calif	d[2]	12 mos.	Sept	16	$374	Certificate
Albany Hospital, Albany, N. Y.	John Ghormley, M. D. Catharine Graham	None	a-b-d	12 mos.	Sept	6	$250	Certificate
Mayo Clinic Section on Physical Medicine, Rochester, Minnesota	Frank H. Krusen, M.D. Miss Lucille Fitzpatrick	None	a-b-c	12 mos.	Sept	30	none	Certificate
Simmons College Program in Physical Therapy, Boston	William T. Green, M.D. Arthur L. Watkins, M.D. Miss Janet B. Merrill	School of Science Simmons College	a[2]-b[7]-d-e[8]	16 mos.	Sept	25	$650	Diploma or Diploma and Degree[8]
University of Colorado Medical Center, Denver, Colorado[1]	Harold Dinken, M.D. Miss Mary Lawrence	University of Colorado Medical Center	a-b-d	12 mos.	Sept	Varies	$300[9]	Certificate
Hermann Hospital School of Physical Therapy, Houston, Texas	Oscar O. Selke, Jr., M. D. Miss Mary E. Kolb	University of Houston	a-b-d	12 mos.	Oct	12	$200	Cert. or Degree

* Courses are so arranged that any of the entrance requirements will qualify students for training. a = Graduation from accredited school of nursing; b = Graduation from accredited school of physical education; c = Two years of college with science courses; d = Three years of college with science courses; e = Four years of college with science courses; H. S. = High school graduation; f = degree in physical education or sciences; g = graduation from an accredited college or university with a B.A. or B.S. degree and at least twenty-six hours in biological and physical sciences.

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7. With adequate science courses.
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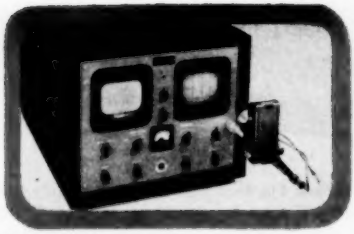
9. Tuition covers entire four years.
10. With twelve semester hours in biological and physical sciences.
11. Degree granted by University of California at Los Angeles.
12. Tuition reduced second semester of second year.

•• At the end of nine months the students can register in the graduate school for a degree of master of science in Physical Therapy.

‡ Rep. in part Nov., 1947, with additions from J. A. M. A. 133:1149 (April 12) 1947.



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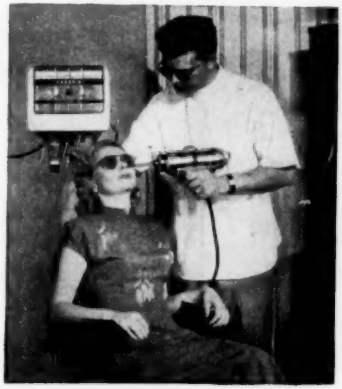

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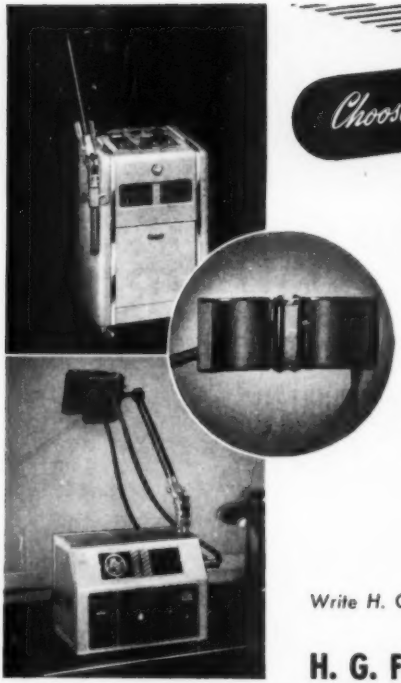

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11:00 to 11:50	9:30 to 10:20	9:30 to 10:20	9:30 to 10:20
3:00 to 3:50			
4:00 to 4:50			

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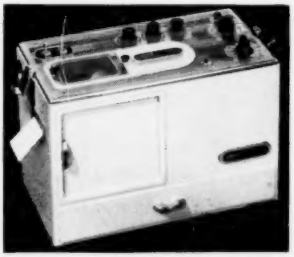

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